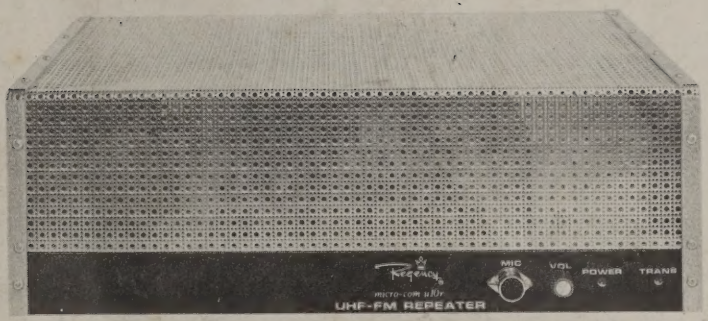
Regency®

ELECTRONICS INC.

INSTRUCTION & SERVICE MANUAL



MODEL MICRO COM U10r

UHF FM REPEATER

7001-4001-100

PRINTED IN U.S.A.

PRICE $12.50

UNPACKING

Check the carton and packing material carefully for the following items:

1 - Repeater unit
1 - Microphone and Connector
1 - Owner's Service Manual
1 - Warranty Card

To be filled out and returned to:

Regency COMMUNICATIONS, Inc.
A subsidiary of Regency Electronics, Inc.
1227 South Patrick Drive
Satellite Beach, Florida 32937

MICRO-COM U10R SERVICE MANUAL

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SECTION I

GENERAL INFORMATION

SECTION 1 GENERAL INFORMATION

1-1 DESCRIPTION

The Regency MICRO-COM U10R is an FM repeater for use in the 450-470 MHz Land Mobile Communications Band. It is equipped with facilities which permit local control of the repeater, for use by a dispatcher and/or for use by maintenance personnel in making tests on the repeater.

As supplied, the repeater may be mounted on a desk or shelf. When equipped with Option MA-109 brackets, it may be mounted in relay rack structures.

The repeater control system provides for the following functions:

1. Operation of the transmitter by tone squelch or noise squelch control.

2. Provisions for plugging in up to seven tone squelch frequencies, for use on community repeater systems. Additional tone squelch frequencies may be added outboard, if desired.

3. Three minute cutoff timer, with warning tone.

4. Transmitter drop out delay.

5. Provisions enabling operation of the repeater by a local operator. These provisions also enable maintenance technicians to receive and transmit test transmissions using each of the installed tone squelch frequencies.

The receiver section is certified under Part 15, Subpart C of the FCC Rules. The transmitter is Type Accepted under the following FCC Rules parts:

21 Domestic Public Radio Services
89 Public Safety Radio Services
91 Industrial Radio Services
93 Land Transportation Radio Services
95 Citizens (Class A) Radio Services

1-2 SPECIFICATIONS

RECEIVER

Antenna Impedance	50 Ohms
Frequency Range	450-470 MHz
Sensitivity	.35uV, 12 DB Sinad
	.50uV, 20 DB Quieting
	.25uV, Carrier Squelch Opening
	.25uV, Tone Squelch Opening
Selectivity	75 DB @ 25 KHz
Spurious and Image	75 DB
Intermodulation Rejection	70 DB
Modulation Acceptance	±7.5 KHz
Frequency Stability	±.00025%, -30°C to +60°C
Audio Response	Within plus 2 and minus 8 DB from a standard 6 DB per octave de-emphasis curve over the frequency range of 300 to 3000 Hz with a 1,000 Hz reference frequency
Audio Output Power, Rated Value	4 watts @ 5% distortion
Maximum Audio Output Power	5 watts @ 10% distortion
I.F. System	Double Conversion 10.7 MHz - 455 MHz

Part 15 FCC Certified

TRANSMITTER

Antenna Impedance	50 Ohms
Frequency Range	450-470 MHz

Power Output	10 Watts (minimum)
Output Frequency Stability	±.00025%, -30°C to +60°C
Spurious & Harmonic Rejection	60 DB
Power Unit Protection	Temperature Limiting Power Control Circuit
Emission	16F3
Microphone	High Impedance Plug-in Ceramic
Modulation	Frequency Modulation with Automatic Deviation Limiting
Deviation	Factory Adjusted to ±5 KHz (max.)
Audio Frequency Distortion	10%
FM Hum and Noise Level	-60 DB
Audio Frequency Response	From 300 to 3000 Hz, within +1 and -3 DB of a 6 DB per octave pre-emphasis characteristic as referred to the 1,000 Hz level

POWER

Power Requirements	117 V.A.C., 60 Hz
Receive Condition	.15 amps
Transmit Condition	.8 amps
Fuse Size	2 Amp. 3AG

GENERAL FEATURES

Outside Dimensions (Excluding Knobs and Connectors)	17½" x 11¼" x 6" High
Vertical Rack Space Requirements	11¼", plus a recommended 8" for access to controls and connectors
Weight	12 lbs.

1-3 EQUIPMENT SUPPLIED

1 - Repeater Unit
1 - Test Microphone and Connector
1 - Receive Channel Crystal, installed to customer specified frequency.
1 - Transmit Channel Crystal, installed to customer specified frequency.
1 - Control Board with connectors to accept three receive and three transmit CTCSS (Continuous Tone Coded Squelch System) modules.
1 - Auxiliary Tone Board, to accept four receive and four transmit CTCSS modules.
1 - CTCSS receive module, installed to customer specified frequency.
1 - CTCSS transmit module, installed to customer specified frequency.

Up to six additional CTCSS receive modules and up to six additional CTCSS transmit modules, installed per customer specified frequencies, supplied at extra cost if ordered.

1-4 EQUIPMENT NOT SUPPLIED

Because of the many varied antenna arrangements possible for repeater use, antennas, antenna connecting cables, and duplexer/cavity accessories are not supplied as a part of the repeater.

Rack mounting adaptors are not supplied as a part of the repeater.

1-5 INSTALLATION

Mechanical Mounting

The U10R is supplied for mounting on a desk, shelf, or other flat surface. For those cases where it is desired to mount the repeater in standard relay racks, mounting brackets are available. The mounting brackets may be attached to the repeater chassis to permit the "top" or equipment side to be located in front of the rack panel surface, or to the rear of the rack panel surface. If space will permit, the front surface mounting is recommended for easy access to the technician adjustments.

In some cases, it is desired that a local operator have access to control of the repeater. For these applications, the repeater may be mounted on the operator's desk top.

The microphone hang-up clip must be mounted so it is electrically grounded to the metal case of the repeater. Mount it in a convenient location, accessible to the technician, or the local operator (if any).

1-6 OPERATION INSTRUCTIONS FOR LOCAL CONTROL POSITION

The operator at the local control position should realize that the unit is a repeater, and that it performs repeater functions for various mobiles, independently of the local control operator's actions, unless interrupted by the local operator when making a transmission over the repeater transmitter.

Volume Control

This control varies the audio volume level to the local loudspeaker, and should be set to a comfortable listening level. It has no control over the volume of the repeating function, and it has no control over the volume of transmissions made over the local microphone.

Power Indicator Lamp

A green indicator lamp is located on the front panel. It is used to show that the power to the repeater unit is "on."

Transmit Indicator Lamp

A red indicator lamp is located on the front panel. When this lamp glows, it indicates that the repeater transmitter is turned on. This lamp will glow whether the repeater transmitter is activated by the local microphone or by a distant mobile.

Tone Squelch Monitoring Function: (For units equipped with Tone Squelch)

When the microphone is placed in its hang-up hook, the Tone Squelch System is effective and only signals from stations having the appropriate tones will be heard in the local loudspeaker.

On shared radio channels, it is considered good manners to listen in on the channel before transmitting. When the microphone is removed from the hook, the Tone Squelch circuits are placed in

the MONITOR condition, and any signal on the channel will be heard regardless of whether it has the appropriate tone coding.

If the operator attempts to transmit a message by merely pressing the microphone button while the microphone remains in the hang-up hook, the tone squelch tone will not be transmitted, and the message will not get through (unless the listening station just happens to be in the MONITOR position at the time).

Microphone

A hand-held microphone is supplied with the unit. To transmit a message, remove the microphone from its hang-up hook, press the push-to-talk button on the side of the microphone, and speak into the microphone. The Transmit Indicator will glow to signify that the transmitter is operating.

Best results are obtained by holding the microphone about one inch from the lips, inclined at about a 30 degree angle away from the face. Speak clearly in a normal tone of voice across the face of the microphone.

1-7 CRYSTAL SPECIFICATIONS

Miniature plug-in crystals are utilized in both the receiver and transmitter sections.

The following Regency Part Number crystals are used:

Transmit Crystals: 302-539
Receive Crystals: 302-540

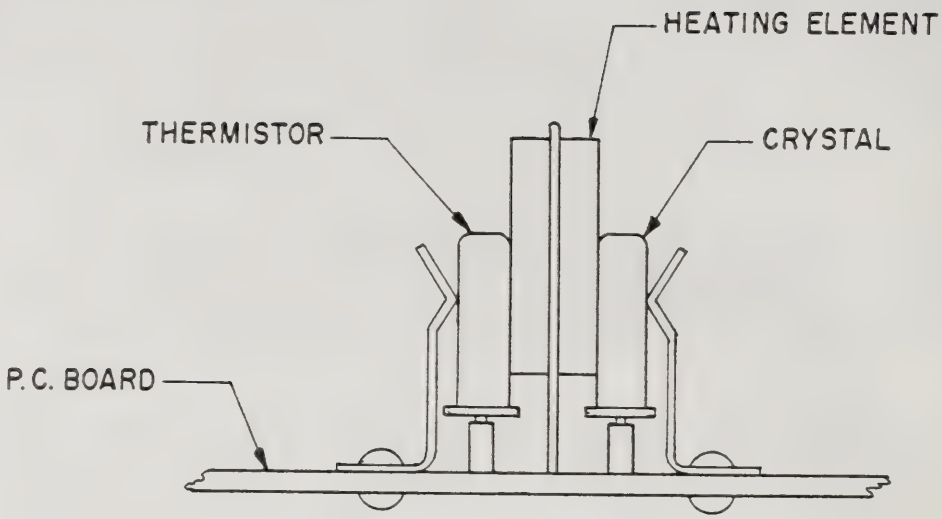
Crystals should be ordered by specifying the above part numbers and the exact channel frequency required.

Installation of crystals requires the services of a competent technician with appropriate test equipment. Instructions for the necessary adjustments are included in the receiver alignment and transmitter tuning procedures later in this manual.

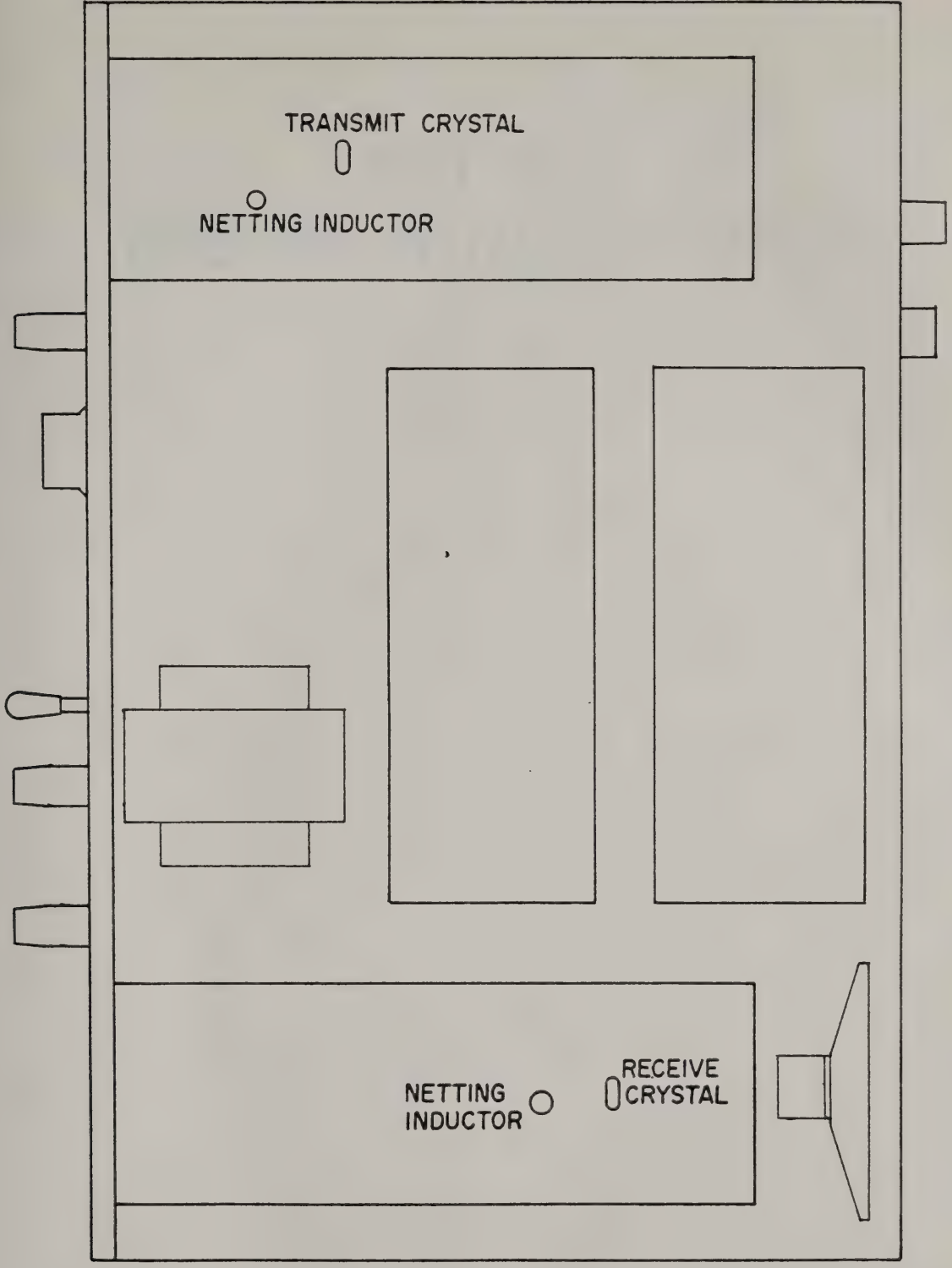
1-8 CRYSTAL INSTALLATION

Special care must be taken to install the crystals correctly. The conduction type crystal heater which is used to warm the crystals at low ambient temperatures relies on having proper physical contact between the heater element and the crystal for effective operation. The Crystal Heater Detail, (Figure 1-9) demonstrates

the correct method of crystal installation. The crystal must be pressed down into the socket pins far enough for the rim around the bottom of the crystal to clear the heating element and allow good contact between the side of the crystal and the element.



1-9 CRYSTAL HEATING DETAIL



1-10 CRYSTAL LOCATION AND ADJUSTMENT DIAGRAM

SECTION 2
REPEATER SYSTEM DESCRIPTION

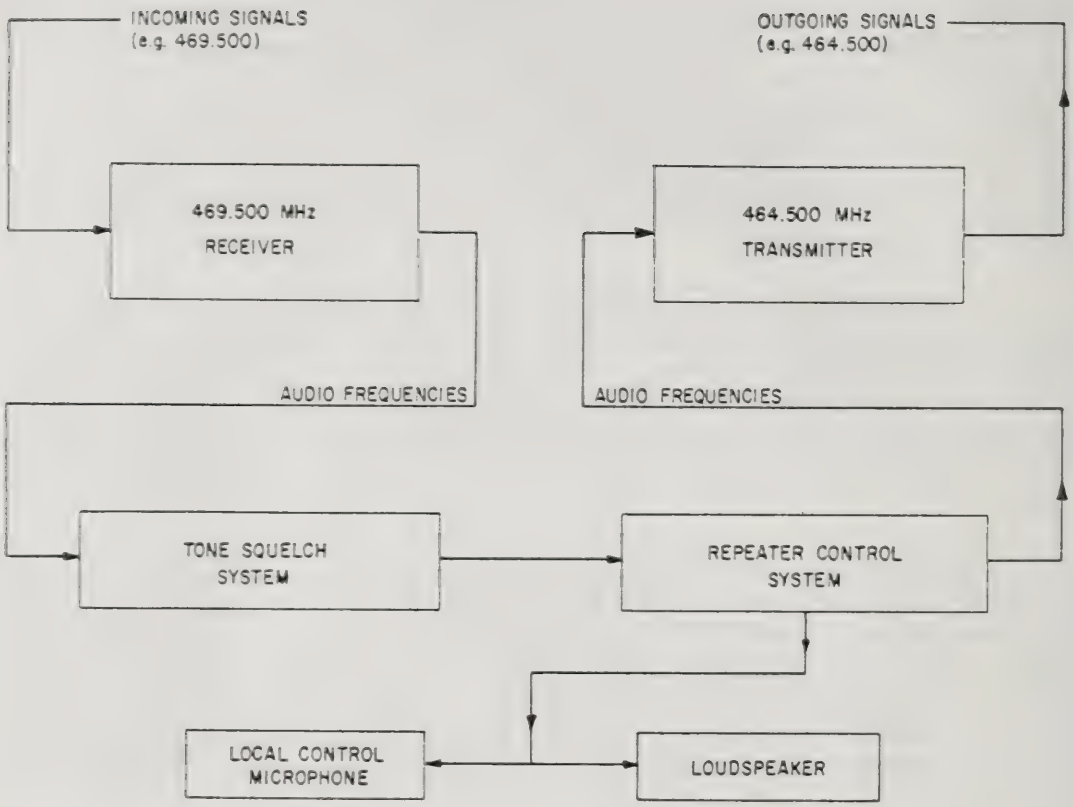
SECTION 2 REPEATER SYSTEM

2-1 DESCRIPTION

A block diagram of the repeater system is shown in Figure 2-2. The block diagram shows the major functions of the various portions of the repeater. To make explanation of the diagram easier to follow, the operating frequencies have been assumed to be 469.50 MHz receive and 464.50 MHz transmit. This follows the pattern of frequency assignments in the 450-470 MHz band in the United States. Mobiles functioning with this system would transmit on 469.50 MHz (so they will be received by the repeater receiver) and would receive on 464.50 MHz (so they will "hear" the repeater transmitter).

As the block diagram shows, signals received on 469.50 are demodulated by the receiver, and the audio intelligence is sent to the tone squelch system. If the received signal has the same tone squelch frequency as one of the installed tone squelch boards, the tone squelch system, acting with the repeater control system turns the transmitter on, and retransmits the original intelligence.

Additionally, as the block diagram shows, an operator at the repeater location can transmit through the local microphone and can hear incoming mobiles through the local loudspeaker. Features within the tone squelch system and the repeater control system permit the operator at the repeater location to transmit one of the tone squelch frequencies, and also enable the loudspeaker to be silent except when a signal with that tone squelch frequency is received.



2-2 REPEATER SYSTEM BLOCK DIAGRAM

SECTION 3
RECEIVER

SECTION 3 RECEIVER

3-1 RECEIVER CIRCUIT DESCRIPTION

The entire receiver is mounted on the receiver circuit board. The antenna is connected to a 2 Section RF Helical Filter, L109 and L110, which acts as a preselector for incoming signals.

Q105 is a grounded gate, low noise, J-FET amplifier. Its output is fed through an additional 2 Section Helical Filter, L112 and L113 and delivered to the gate of Q106, a J-FET mixer.

L.O. (Local Oscillator) injection for the J-FET mixer Q106 is a frequency of 10.7 MHz lower than the incoming signal frequency. It is obtained from a crystal oscillator-multiplier chain, consisting of Q101, Q102, Q103, and Q104. Q101 is a crystal oscillator, using a third overtone crystal in the 48.8 to 55.7 MHz range. The output circuit of Q101 oscillator is tuned to the third harmonic of the crystal frequency, and this harmonic is amplified by a buffer-amplifier consisting of Q102 and Q103. Q103 drives Q104, which operates as a frequency tripler, providing the wanted local oscillator injection frequency. This wanted injection frequency is separated from various harmonics and subharmonics by the L114 and L115 section of the helical filter and delivered to the source of the mixer, Q106.

The output of Q106 consists of a 10.7 MHz IF signal which is fed to a six-pole monolithic crystal filter, consisting of FL101, FL102, and FL103. This filter provides most of the adjacent channel selectivity of the receiver. The signal is then amplified by integrated circuit, IC102, which contains another amplifier for 10.7 MHz, the second mixer circuitry and the second L.O. circuitry, operating at 10.245 MHz.

The 455 KHz output of IC102 (terminal 5) is coupled through a tuned circuit to the input of the ceramic filter, FL104. FL104 is a narrow-band filter centered at 455 KHz, and it provides additional adjacent channel rejection. The output of FL104 is amplified and coupled through a tuned circuit to the input of integrated circuit IC103. IC103 is a series of amplifiers providing approximately 60 DB gain at 455 KHz. Also included in IC103 is the limiting circuitry and a quadrature detector circuit. L123, connected between terminals 2 and 12 of IC103, is the adjustable quadrature coil.

The audio output from IC103 (terminal L) is coupled to the input of the audio amplifier circuit and to the input of the noise-operated squelch circuit.

Transistor Q110 is an amplifier whose frequency response extends from approximately 4 KHz to 25 KHz. Q110 amplifies the noise occurring in this frequency range. The noise is coupled to the base of Q111. Q111 is used as a detector which rectifies the amplified noise and produces a DC voltage at its collector. When the DC voltage at the collector of Q111 is positive and of sufficient value to provide essentially a short circuit between the base of Q113 and the audio output from the receiver is squelched (muted). When a signal carrier arrives, the noise input to the detector (Q111) is reduced to the point where the DC voltage at the base of Q112 is no longer sufficient to cause Q112 to conduct.

At this time, Q113 is allowed to conduct normally and the audio output of the unit is heard. With the audio preamplifier, (Q113) operating normally, audio is applied through the volume control to the input of the audio amplifier, IC104. Q113 supplies a signal to the audio amplifier IC104, which amplifies the audio to loudspeaker level.

3-2 RECEIVER VOLTAGES

NOTE: All voltages are nominal and are measured with a VTVM, at 13.0 VDC supply voltage.

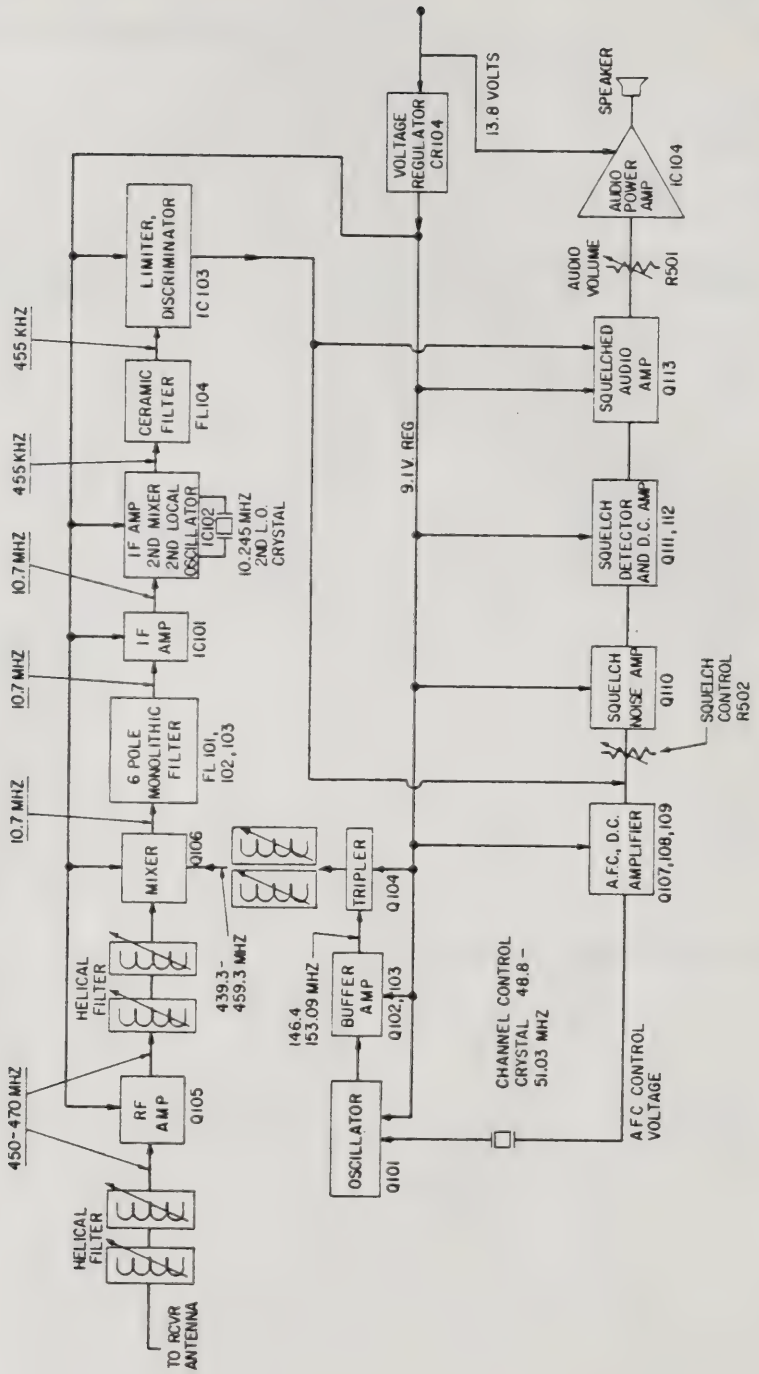
VOLTAGE DATA

Receiver Transistors:

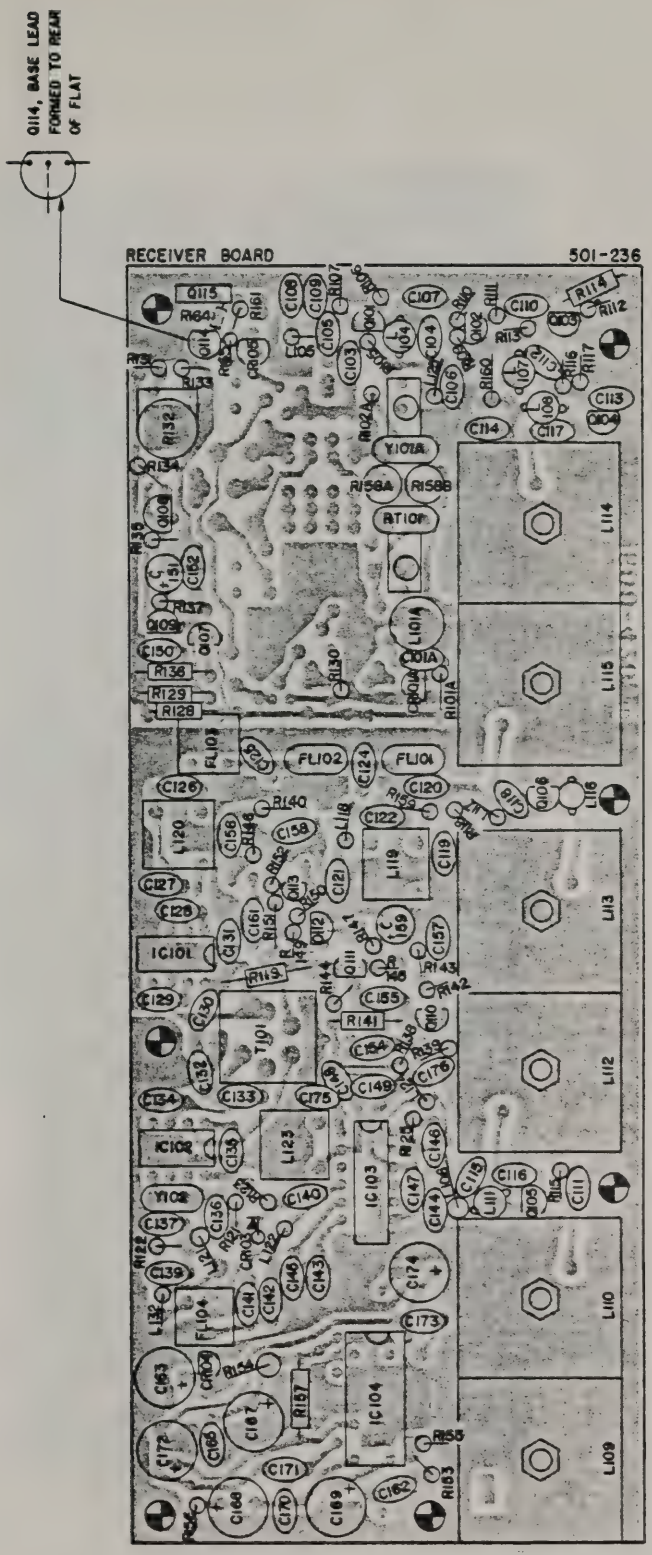
	Emitter	Base	Collector
Q101	1.1	1.5	9
Q102	4.2	5.0	9
Q103	0	0.2	5.2
Q104	0	-0.15	5.2
Q105 (FET)	1.7 (Source)	0 (Gate)	9 (Drain)
Q106 (FET)	0.9 (Source	0 (Gate)	9 (Drain)
Q107 (PNP)	8.7	8.2	5.0
Q108	3.6	4.2	8.2
Q109	3.6	4.2	8.2
Q110	1.0	1.6	5.8
Q111	9.1	9.1	0 (Unsquelched)
	9.1	9.5	9.0 (Tight Squelch)
Q112	0	0	2.6 (Unsquelched)
	0	0.7	0 (Tight Squelch)
Q113	1.3	2.6	6.4 (Unsquelched)
	1.7	0	9.1 (Tight Squelch)
Q114	0.4	0.8	13.0 @ 25°C
Q115	0	0.4	13.0 @ 25°C

Receiver Integrated Circuits:

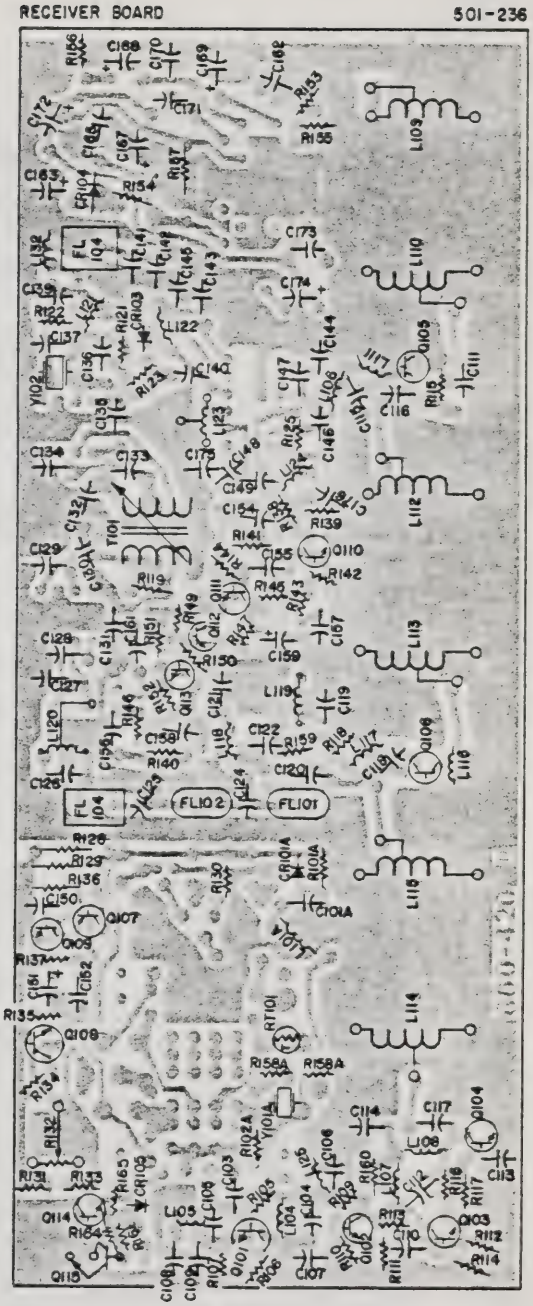
IC No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
IC101	1.7	0.6	0.6	0	3.7	0	2.0	3.7	-	-	-	-	-	-
IC102	2.2	0.6	0.6	2.2	3.8	0	2.2	3.8	-	-	-	-	-	-
IC103	4.8	3.2	-	1.3	1.3	1.3	0	0	0.14	-	-	3.2	9.1	5.4
IC104	13.0	-	-	12.9	0.5	0.5	6.0	0	0	0	-	6.0	-	-



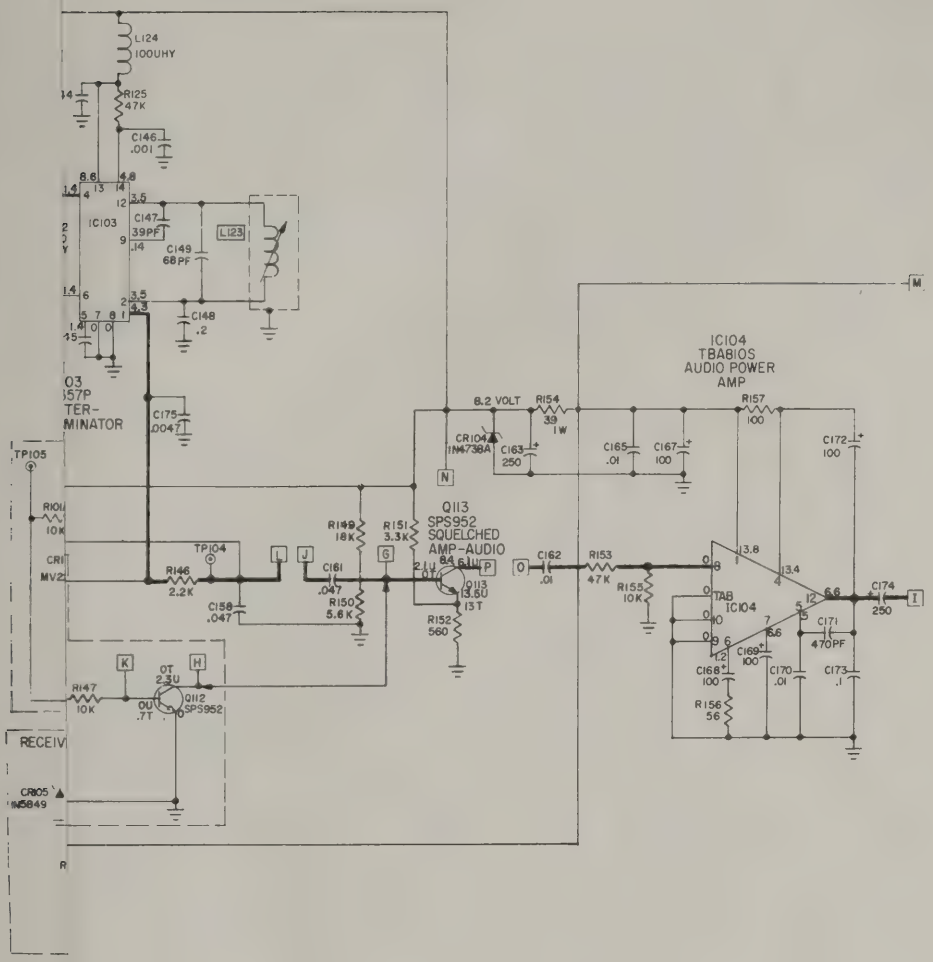
3-3 RECEIVER BLOCK DIAGRAM



3-4 RECEIVER BOARD TOP VIEW



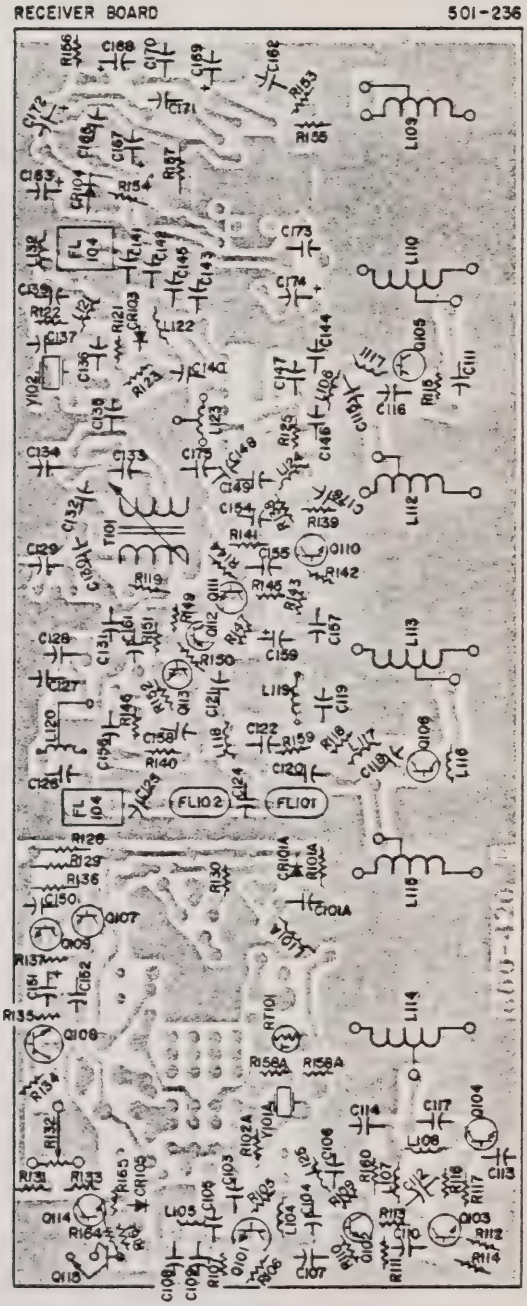
3-5 RECEIVER BOARD BOTTOM VIEW



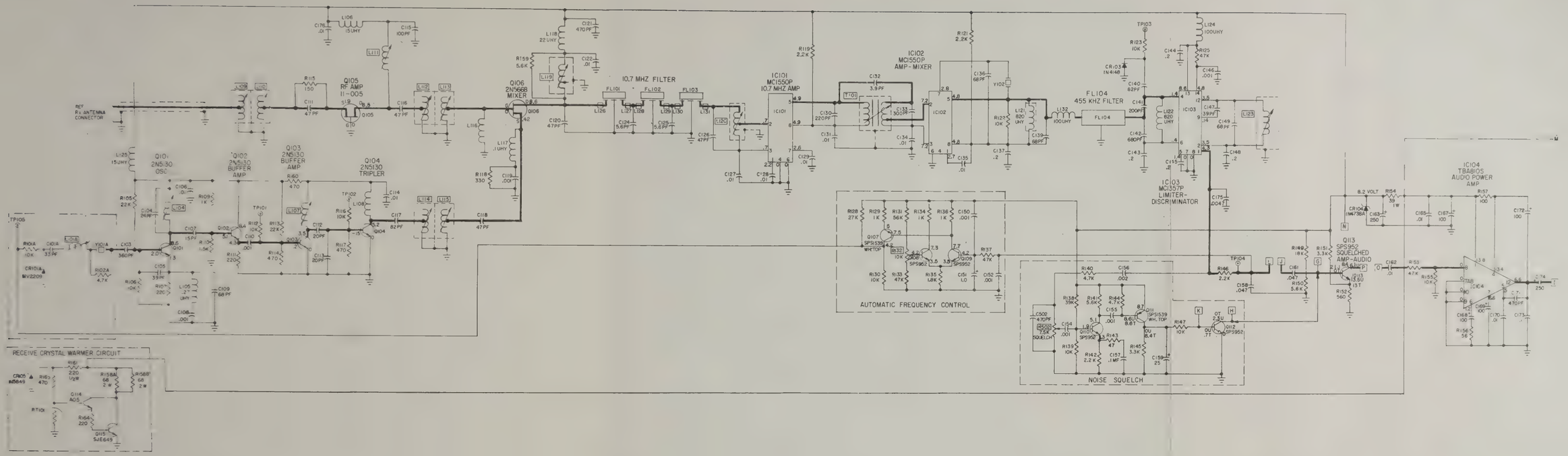
NOTES

1. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS. ALL RESISTORS NOT SPECIFIED OTHERWISE ARE ¼ W.
2. ▭ DENOTES ADJUSTABLE COMPONENTS.
3. □ DENOTES CIRCUIT JUNCTION POINTS.
4. HEAVY LINE DENOTES APPARENT SIGNAL FLOW
5. ALL VOLTAGES ARE NOMINAL VALUES AS MEASURED WITH A VTVM, SUPPLY VOLTAGE = 13.8 VDC AT INPUT [M]
   LETTER FOLLOWING A VOLTAGE INDICATES THE FOLLOWING CONDITIONS
   u = UNSQUELCHED
   s = SQUELCHED - THRESHOLD
   t = SQUELCHED - TIGHT

3-6 RECEIVER SCHEMATIC



3-5 RECEIVER BOARD BOTTOM VIEW



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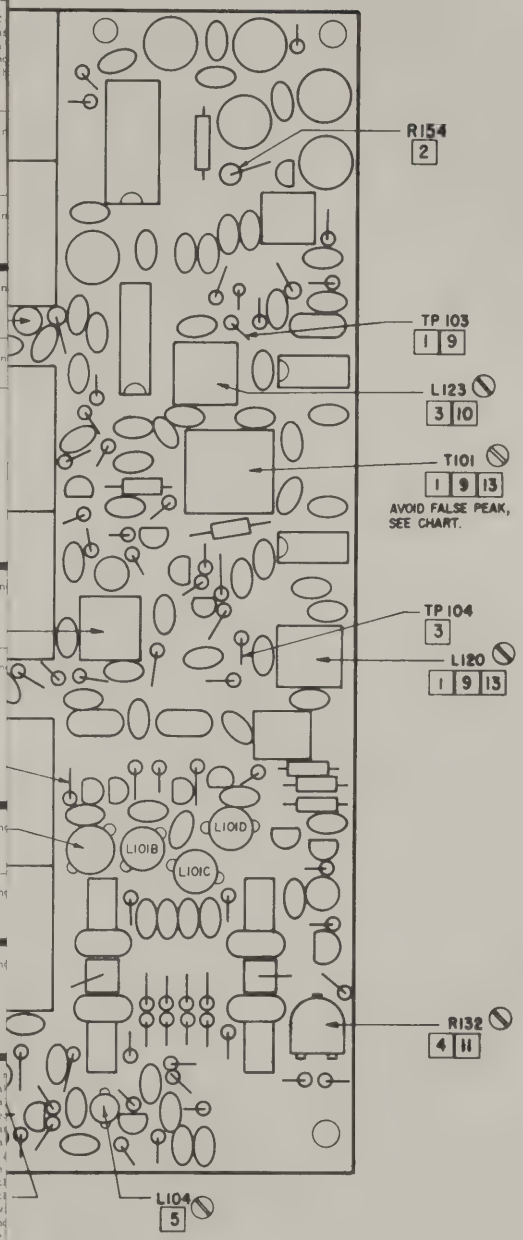
3. ▭ DENOTES CIRCUIT JUNCTION POINTS
4. HEAVY LINE DENOTES APPARENT SIGNAL FLOW
5. ALL VOLTAGES ARE NOMINAL VALUES AS MEASURED WITH A VTVM, SUPPLY VOLTAGE +13.8 VDC AT INPUT (M)
   LETTER FOLLOWING A VOLTAGE INDICATES THE FOLLOWING CONDITIONS
   U = UNSQUELCHED
   S = SQUELCHED - THRESHOLD
   T = SQUELCHED - TIGHT

3-6 RECEIVER SCHEMATIC

During the receiver alignment procedure
(i.e., unsquelched). Set volume contro
cycle tone during the alignment procedu

	Signal Source	Obse
Preliminary I.F. alignment. Not necessary if radio has not been badly misaligned.	10.7 MHz Signal Generator, unmodulated. Connect Signal Generator to Drain of Q106, using a series 10,000 ohm resistor.	TP103, usin
		Measure DC of R154, us (R154 is a resistor mo close to t chassis)
		TP104, usin
		TP105, usin
	None Required.	TP101, usin
		TP102, usin
	Signal generator source capable of being set to within ±.000254 of channel frequency. Set signal generator output channel frequency. Modulate generator with a 1000 Hz tone, with ±3 KHz peak modulation deviation. On multiple channel radio, do alignment on channel #1.	TP105, usin
		TP1 8, usin
	Reduce signal generator output to zero signal. If generator attenuator does not permit signal to be reduced below receiver noise level, disconnect signal generator from antenna jack.	TP104, usin
		TP105, usin
	Bring signal generator attenuator up to a level that gives a good, quieting, signal. Be sure signal generator is accurately set to channel frequency.	TP105, usin
Final touch up for optimum sensitivity	Signal generator, as above, tuned to exact channel frequency, and modulated by a 1000 Hz tone, with peak modulation deviation of 3 KHz.	Distortion to loudspea Follow usua meter proce ting null a trols. If a ter is not step may be observing t signal on t terminals w loscope, an least noise trace. Do N touch up th an unmodula tuning for will result sponse from ter and poo performance
Final discriminator & AFC check	Signal generator, as above, be sure it has not drifted off channel.	

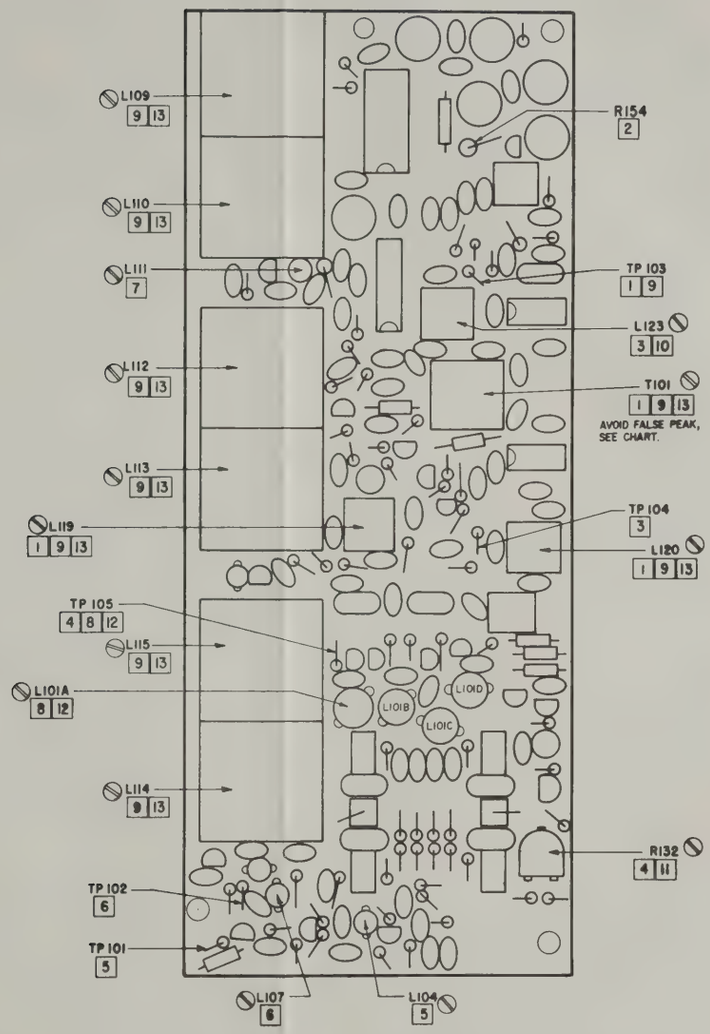


R ALIGNMENT CHART

RECEIVER ALIGNMENT PROCEDURE

During the receiver alignment procedure, set the squelch control to maximum counter clockwise position, (i.e., unsquelched). Set volume control to comfortable listening level. Listening to received 1,000 cycle tone during the alignment procedure helps to avoid alignment errors.

	Signal Source	Observe	Adjust	Expected Reading, Notes
Preliminary T.P. alignment. Not necessary if radio has not been badly misaligned.	10.7 MHz Signal Generator, unmodulated. Connect Signal Generator to Drain of Q106, using a series 10,000 ohm resistor.	TP103, using DC VTVM	#1 Adjust L119,L120,T101 (top and bottom slugs) for maximum TP103 voltage.	Adjust signal generator output level to obtain a .3 volts positive reading at TP103. As alignment progresses, reduce signal level to maintain the .3 volts reading.
		Measure DC voltage at top of R154, using DC VTVM. (R154 is a 39 ohm, 2 watt resistor mounted on end, close to the rear of the chassis)	#2 No adjustments in this step.	Measured voltage should be close to 8.2 volts. From this measurement, determine proper discriminator set voltage. Discriminator set voltage will be 1/2 of voltage at top of R154.
		TP104, using DC VTVM	#3 Adjust L123 to obtain the proper discriminator set voltage as determined by Step 2.	This is a discriminator adjustment. TP104 voltage should swing through the discriminator set voltage determined in Step 2.
		TP105, using DC VTVM	#4 Adjust R132 to obtain +4.0 volts reading at TP105.	This adjusts output of AFC amplifier to be at +4.0 volts when receiving an on-channel signal.
	None Required	TP101, using DC VTVM	#5 Tune L104 for minimum positive or maximum negative reading on TP101.	0 to 4.2 volts. +.3 volts indicates oscillator is not oscillating.
		TP102, using DC VTVM	#6 Tune L107 for maximum negative reading on TP102.	to -1 volts.
			#7 If the channel frequency is below 467 MHz, set the aluminum core on L111 even with the top of the coil form. If the channel frequency is above 467 MHz, set the aluminum core on L111 all the way to the bottom of the coil form. If not sure, set it for channel #1, then adjust L1... during the tuning procedure.	
	...r generator source capa... being set to within ... channel frequen... Set signal generator output channel ... late generator ... ... #3 KHz peak modulation deviation. On multiple channel radio, do alignment on channel #1.	TP105, using DC VTVM	#8 Adjust L101A to obtain +4.0 volts reading on TP105.	This is the receiver frequency adjustment. TP1... reading should swing through ... setting as L101 is adjusted.
		TP103, using DC VTVM	#9 Adjust L109,L110,L112,L113, L114,L115,L119,L120, and T101 top and bottom slugs for maximum reading at TP103.	As alignment progresses, reduce signal generator output level to maintain about .3 volts output at TP103. Caution: It is possible to tune the slugs on T101 to a false peak. Correct peak is the one with both top and bottom slugs furthest out from the center of the transformer.
	Reduce signal generator output to zero signal. If generator attenuator does not permit ... below receiver noise ..., disconnect signal generator from antenna jack.	TP104, using DC VTVM	#10 Adjust L123 to obtain proper discriminator set voltage as determined in Step ...	This adjusts discriminator to center of receiver bandpass.
		TP105, using DC VTVM	#11 Adjust R132 to obtain +4.0 volts reading at TP105.	This adjusts AFC voltage to center value when no signal received.
	Bring signal generator attenuator up to a level that gives a good, quieting, signal. Be sure signal generator is accurately set to channel frequency.	TP105, using DC VTVM	#12 Adjust L101A to obtain +4.0 volts reading on TP105. On multiple channel receivers, repeat this in channels 2,3, and 4, adjusting L101B,C, and D respectively.	This adjusts receiver local oscillator chain to proper center frequency.
Final touch up for optimum sensitivity	...nal generator as above, ... to exact channel fre... modulated by a ... with peak mod... deviation of 3 KHz.	Distortion meter, connected to loudspeaker terminals. Follow usual distortion meter procedures for setting null and level control. ... Observing the 1,000 cycle signal on the loudspeaker terminals with an oscil... and tuning for ... noise on the sine wave ... Do NOT attempt to touch up the tuning by using an unmodulated signal and tuning for silencing; this will result in a peaked response from the crystal filter and poor weak signal performance.	#13 Adjust L109,L110,L112,L113, L114,L115,L119,L120,T101, (top and bottom).	During this procedure keep signal level from the signal generator at a value sufficient to obtain a -12 db(25%) reading on the distortion meter. Remember that this is a "touch up" type of adjustment. None of the adjustments should be moved more than a small amount from the setting previously obtained.
Final discriminator & AFC check	Signal generator, as above, be sure it has not drifted off channel.		#14 Repeat steps 3 and 4 with zero signal input. Repeat step 12 on each channel with a strong signal.	



3-7 RECEIVER ALIGNMENT CHART

SECTION 4
TRANSMITTER

SECTION 4 TRANSMITTER

4-1 TRANSMITTER CIRCUIT DESCRIPTION

AUDIO SECTION

Integrated Circuit IC201 (sections A and B) constitutes the audio circuitry of the transmitter. IC201A provides a high impedance input for the ceramic microphone, and supplies pre-emphasis and amplification prior to the modulation limiting circuit which consists of CR210 and CR211. IC201B provides additional amplification, and acts as an active filter to provide the post-limiter filter action. The output of IC201B is fed to a control potentiometer which controls the audio voltage sent to the modulator section and, therefore, is used to set the peak modulation deviation of the transmitter.

IC201B also provides an amplified input to feed tones for continuous tone squelch systems, or other tone systems, into the transmitter modulation circuits.

CRYSTAL OSCILLATOR

Y201 serves as the crystal oscillator, using a crystal at 1/36 of the channel frequency. The crystal is a fundamental cut, in the frequency range 12.5 to 14.3 MHz.

Direct frequency modulation of the crystal is obtained by applying the modulation signals from the audio section to varactor modulator diode, CR201A.

FREQUENCY MULTIPLIER SYSTEM

The output of the crystal oscillator, Q201, is tuned to three times the crystal frequency, and this signal is amplified by buffer-amplifier Q202, then delivered to the tripler circuit, Q203, then delivered to the doubler circuit Q204. Q204 drives another doubler, Q205, to obtain a combined frequency multiplication of 36 to reach the channel frequencies from 450-470 MHz. The doubler Q205 developes about 150 milliwatts of power to drive the power output module IC501.

POWER OUTPUT SECTION

The packaged power output module, IC501, contains three cascaded stages of power amplification. Its gain, and therefore its power output, can be controlled over certain limits by the power

control circuit consisting of R227 and Q206, which varies the DC voltage input to one of the early amplifier stages. In normal operation, R227 is adjusted to provide the rated output from the transmitter, but it can be set for reduced power operation for special applications. In order to protect the power module from possible damage through overheating , a thermal protection circuit is included. RT201 is a thermistor that rapidly increases in resistance as its temperature reaches certain levels. RT201 is attached to one of the mounting bolts on IC501. When the temperature approaches excessive levels, RT201 increases in resistance, thereby reducing the voltage supplied to IC501 by the power control circuit.

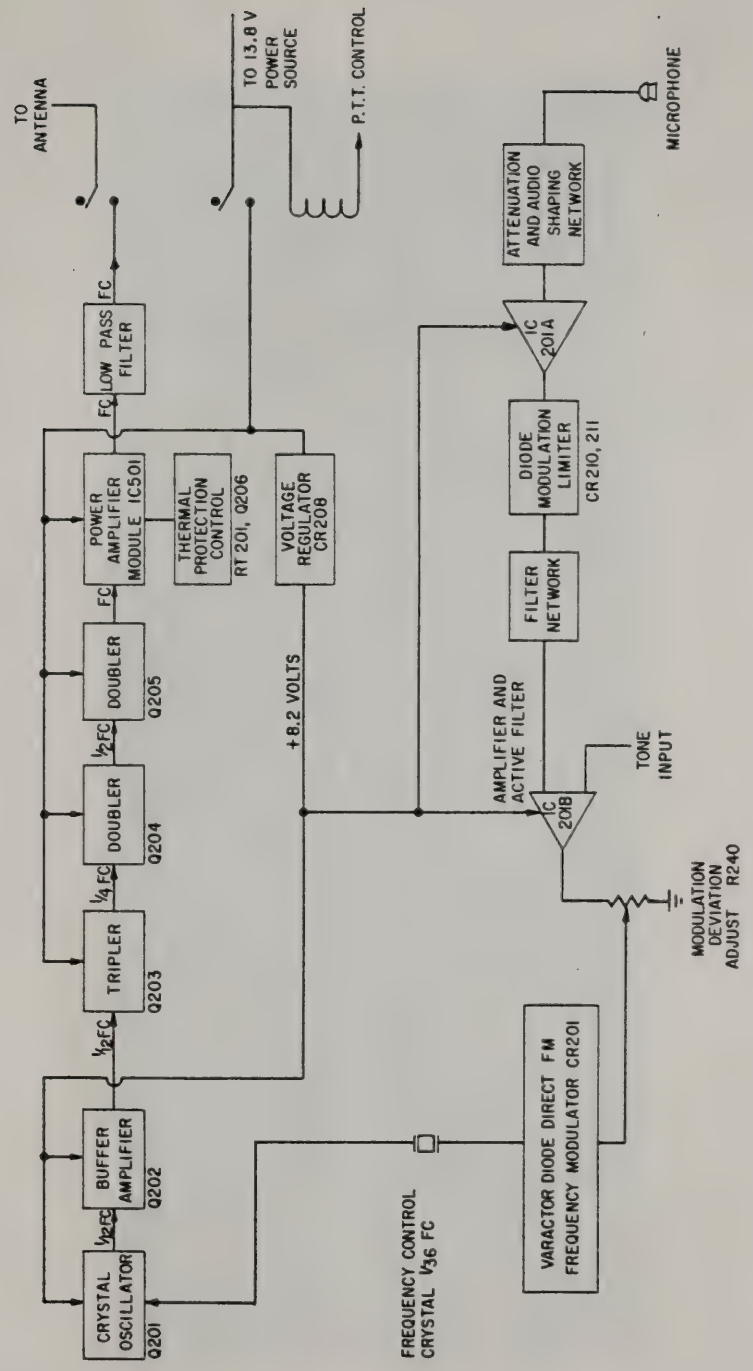
4-2 TRANSMITTER VOLTAGES

Transmitter Transistors:

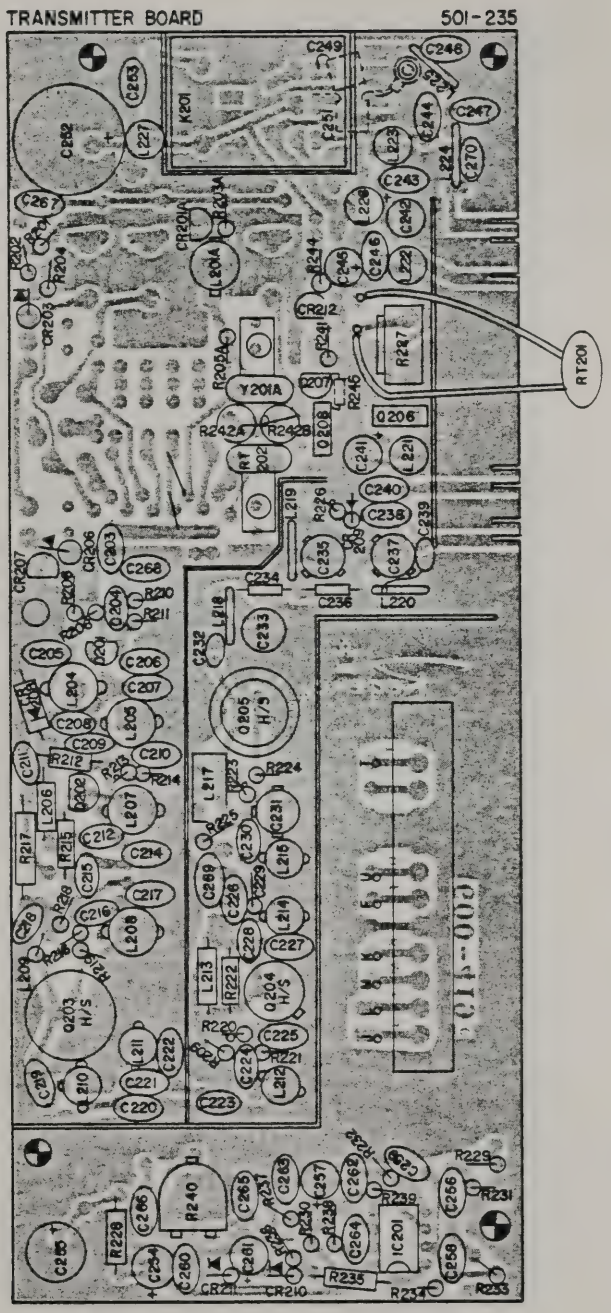
	Emitter	Base	Collector
Q201	3.0	2.0	8.2
Q202	0	0.55	6.0
Q203	0	0.34	10.0
Q204	0	0.05	12.0
Q205	0	-0.62	13.8
Q206 (PNP)	7.0	7.4	11.0
Q207	0.4	0.8	13.0 @ 25°C
Q208	0	0.4	13.0 @ 25°C

Transmitter Integrated Circuits:

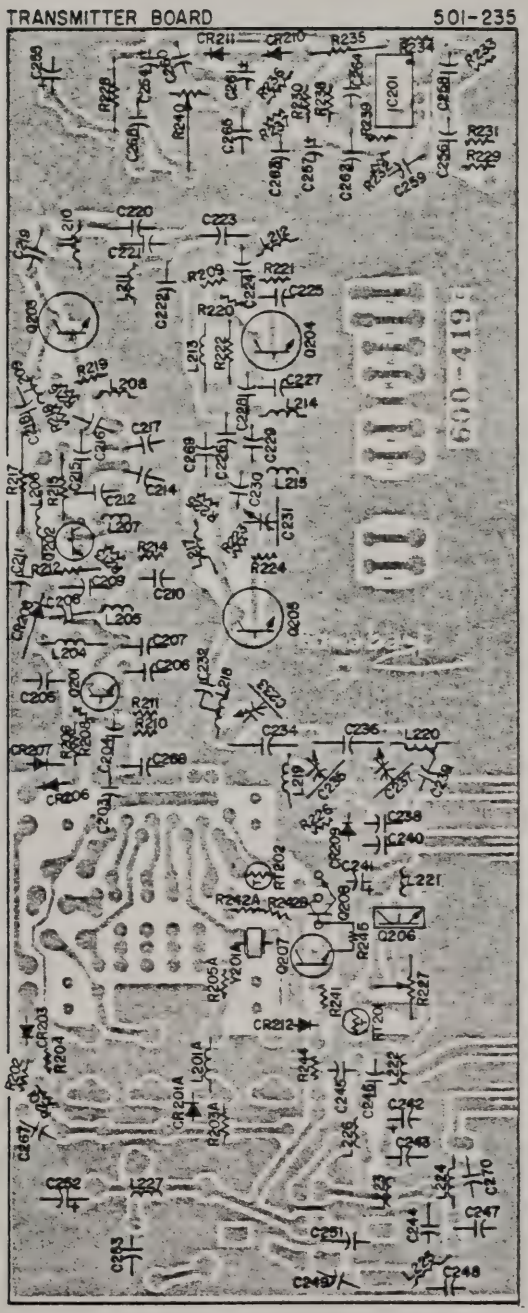
IC No.	1	2	3	4	5	6	7	8
IC201	4.0	4.0	4.0	0	4.0	4.0	4.0	8.2
IC501	0	0	13.8	0	6.6	0	-0.1	-



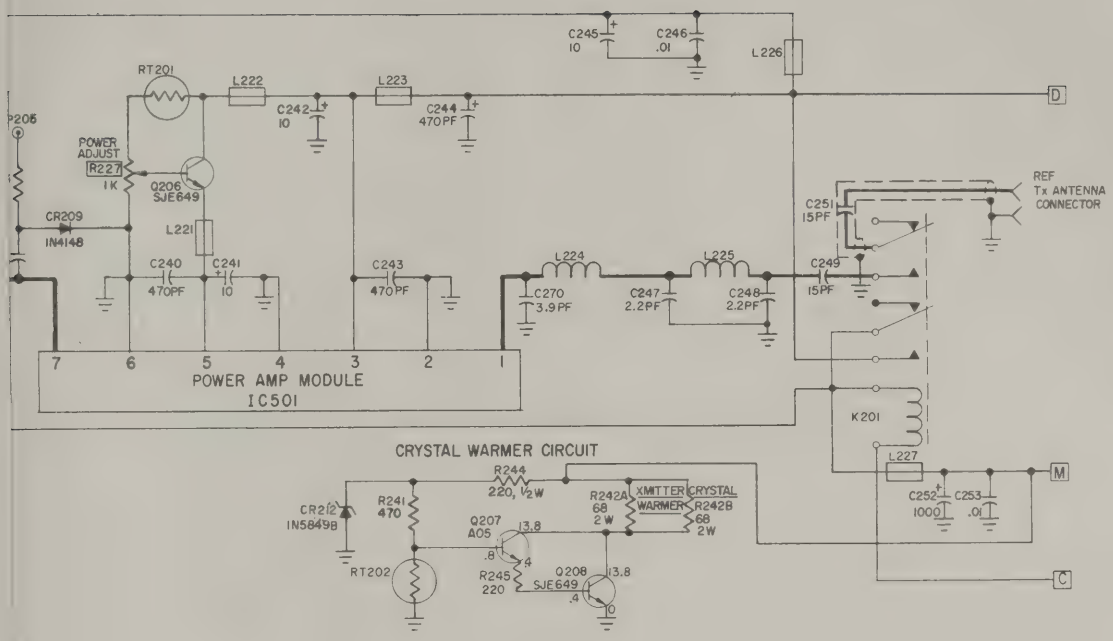
4-3 TRANSMITTER BLOCK DIAGRAM



4-4 TRANSMITTER BOARD TOP VIEW



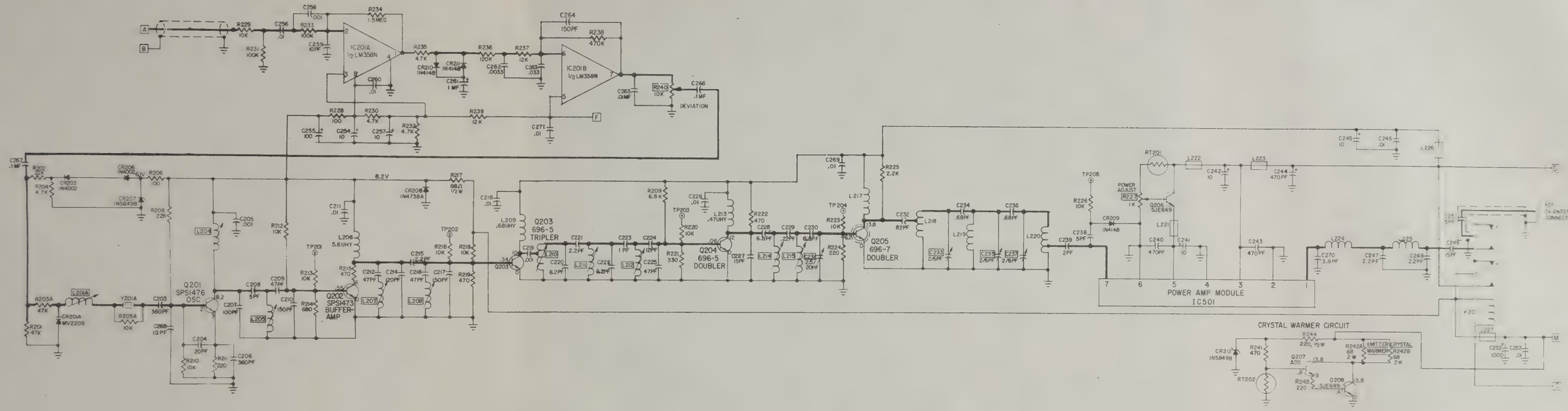
4-5 TRANSMITTER BOARD BOTTOM VIEW



NOTES

1. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS, ALL RESISTORS NOT SPECIFIED OTHERWISE ARE ¼ W.
2. ▭ DENOTES ADJUSTABLE COMPONENTS.
3. □ DENOTES CIRCUIT JUNCTION POINTS.
4. HEAVY LINES DENOTES APPARENT SIGNAL FLOW.
5. ALL VOLTAGES ARE NOMINAL VALUES AS MEASURED WITH A VTVM, SUPPLY VOLTAGE = 13.8 V D.C. AT INPUT TO [M]. VOLTAGES INDICATED ARE MEASURED WITH TRANSMITTER IN OPERATION AND CONNECTED TO A PROPER LOAD.

4-6 TRANSMITTER SCHEMATIC



NOTES
1. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS, ALL RESISTORS NOT SPECIFIED OTHERWISE ARE ¼ W.
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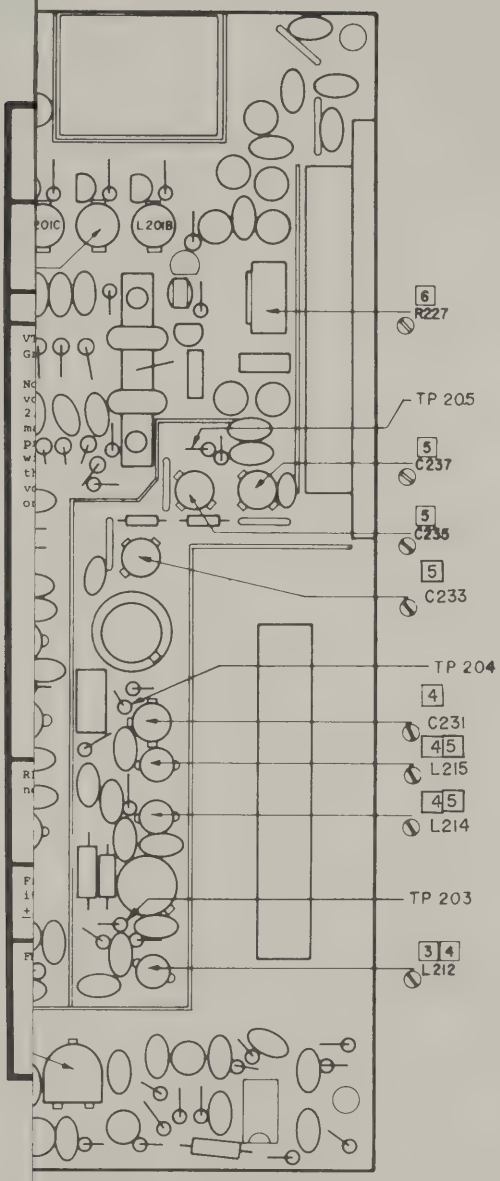
3. ○ DENOTES CIRCUIT JUNCTION POINTS.
4. HEAVY LINES DENOTES APPARENT SIGNAL FLOW
5. ALL VOLTAGES ARE NOMINAL VALUES AS MEASURED WITH A VTVM, SUPPLY VOLTAGE=13.8 V DC AT INPUT TO M. VOLTAGES INDICATED ARE MEASURED WITH TRANSMITTER IN OPERATION AND CONNECTED TO A PROPER LOAD.

4-6 TRANSMITTER SCHEMATIC



MITTER TUNING CHART

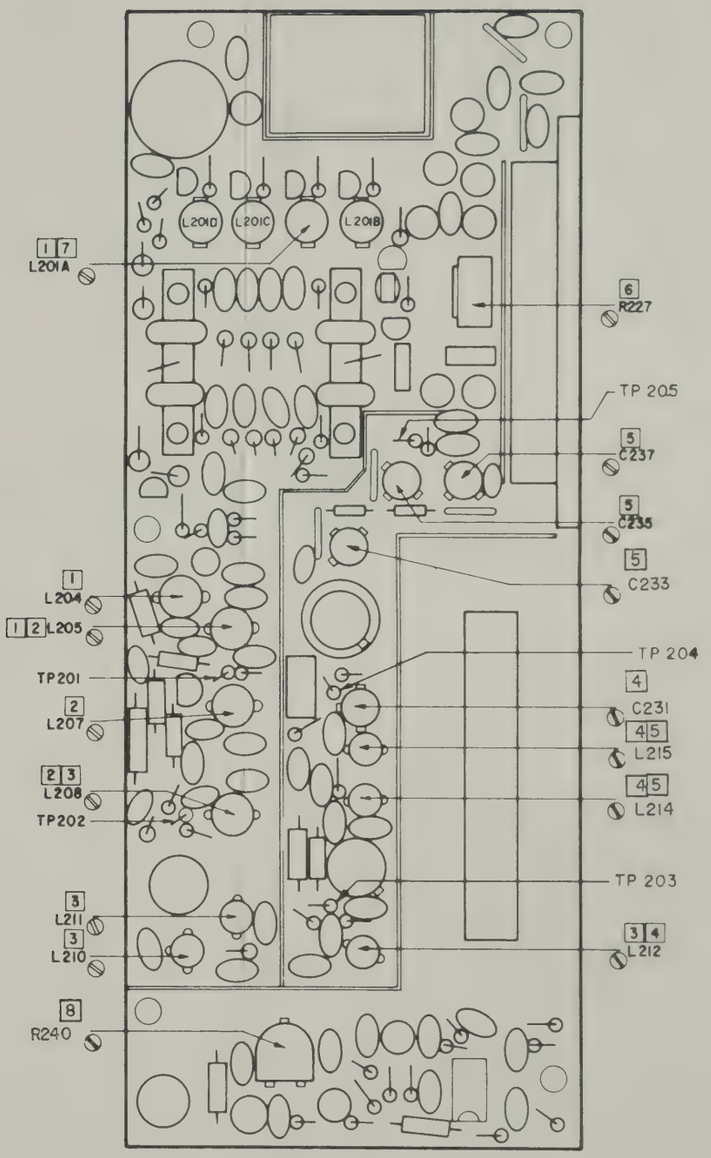
TRANSMITTER TUNING

During Tune-Up Procedure, press the microphone button only when actually taking readings or making tuning adjustments. Until tune-up is completed, keep transmitter on time to a minimum.

Connect a 50 ohm load and R.F. wattmeter to the antenna terminal.

On multiple channel transmitters, conduct first tuning on highest frequency channel.

Test Meter	Observe	Adjust	Expected Reading
VTVM Ground lead on chassis Note: a 20,000 ohm per volt multimeter, on the 2.5 or 5 volts scale may be used for these proceedings. Readings will be 20% lower than those given here on 2.5 volt scale, and 10% lower on 5 volt scale.	TP201	#1 L201, and L205. L204 for minimum positive voltage reading (or maximum negative if TP2 goes negative).	+.55 volts, no drive +.4 to -.3 volts normal. A false peak on L205 is possible, look for biggest one.
	TP202	#2 L207 and L208 for minimum positive (or maximum negative) voltage reading. Then touch up L205 for maximum negative voltage reading.	+.5 volts, no drive +.25 to -.3 volts normal.
	TP203	#3 L210, L211, L212 for negative voltage reading. Then touch up L208 for maximum negative reading.	0 volts, no drive -.1 to -.4 volts normal.
	TP204	#4 L214, L215 and C231 for maximum negative reading. Then touch up L212 for maximum negative reading.	0 volts, no drive -.7 to -.9 volts normal.
	TP205	#5 C233, C235, C237 for maximum negative reading. Then touch up L214, L215, C235 for maximum negative reading.	0 volts, no drive -3 to -5 volts normal.
RF power meter, connected to antenna jack.	RF power output	#6 R227 to 10 watts output	10 watts normal.
	In multiple channel transmitters, if spacing between highest and lowest channel exceeds 3 MHz go back through all but the first step and tune for a compromise adjustment between the highest and lowest channel.		
Frequency meter, FM monitor or counter, with ± .00025% accuracy.	#7 Switch to channel #1 and adjust L201A to exact channel frequency. Then switch to channels 2,3, and 4, and adjust L201B, L201C, and L201D respectively to exact channel frequency. If either L201A,B,C,D have been changed appreciably during this step, go back and repeat the frequency setting on all channels.		
FM Modulation Monitor	#8 Inject a 100 millivolt (.1 volt) tone at 1,000 Hz into the microphone jack (pin #4 high, pin #1 ground), and adjust R240 so modulation deviation just reaches ± 5 KHz peak. Then, in CTCSS units, remove the 1,000 Hz tone and adjust R605 on the CTCSS board to obtain ±.75 KHz peak modulation deviation on the CTCSS tone. Reinsert the 1,000 Hz tone and adjust R240, so combined modulation peak deviation of the 1,000 Hz tone and the CTCSS tone is ± 5 KHz peak. If R240 was changed much, recheck the deviation due to the CTCSS tone alone, to be sure you still have .75 KHz peak deviation on CTCSS tone.		



4-7 TRANSMITTER TUNING CHART

SECTION 5

POWER SUPPLY

SECTION 5 POWER SUPPLY

5-1 REGULATED POWER SUPPLY CIRCUIT DESCRIPTION

The circuit diagram of the power supply is shown as a part of the overall repeater schematic, in Section 7.

The power supply transformer T501 transforms the 117 VAC line voltage to 38 VAC, center tapped, at the secondary. Rectifiers CR501, CR502, CR503, CR504 and filter capacitor C503, rectify and filter this secondary voltage to produce approximately 23 VDC which is reduced to 13.0 VDC by the series-pass regulator transistor Q501. CR501, CR502, and C502 provide a separate 23 VDC supply for the Regulator Board Circuitry.

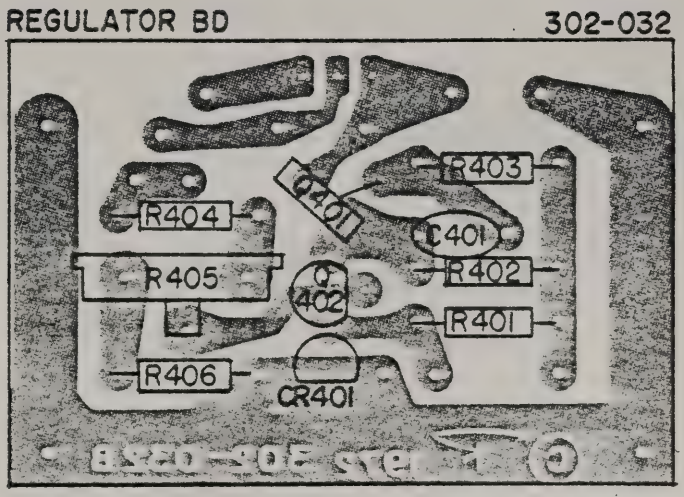
The regulator circuitry operates as follows:

R404, R405, and R406 divide Q501's output (emitter) voltage down to a sample voltage slightly higher than that of CR401. Q402 continuously compares this sample voltage with the reference voltage of CR401 and adjusts the drive through amplifier Q401 to the regulator transistor Q501 accordingly.

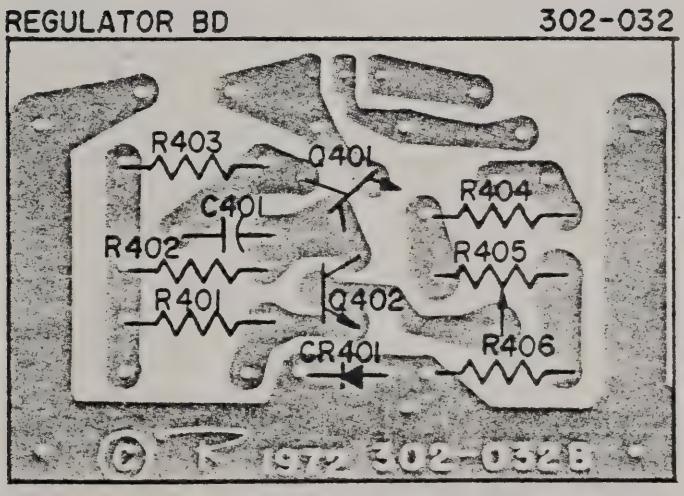
As an example, assume that the radio set (load) increases the current drain on Q501, causing the output voltage, and consequently the sample voltage, to drop slightly. The reduction of base-emitter voltage of Q402 would cause a slight decrease in collector current which in turn would increase drive to Q401 (through R402). Q401 would then increase the base current to Q501 causing it to supply more current to the load and raise the output voltage slightly. In this manner an equilibrium is reached. Potentiometer R405 allows adjustment of the output voltage which is normally set for 13.0 VDC under Receive (standby) conditions.

5-2 POWER SUPPLY VOLTAGES

	Emitter	Base	Collector
Q401	13.8	15.6	23
Q402	6	6.5	15.6
Q501	13	13.8	23



TOP VIEW



BOTTOM VIEW

FIG. 5-3

SECTION 6

MA-90 TONE ENCODER-DECODER, & MA-95 ENCODER

SECTION 6 MA-90 TONE ENCODER-DECODER, AND MA-95 TONE ENCODER

6-1 GENERAL INFORMATION

The model MA-90 Tone Squelch Encoder-Decoder is used as a tone decoder for CTCSS (tone squelch) operation of the Regency MICRO-COM U10R repeater. Since the MA-90 can serve as either an encoder or a decoder, it can be used in either the encoder or decoder sockets of the U10R repeater.

The model MA-95 Tone Squelch Encoder is a simplified version of the MA-90 encoder-decoder, in which only those components needed for the encoding function are installed.

Normally, for each tone frequency accommodated by the MICRO-COM U10R repeater, one MA-90 is installed in a decoder position and one MA-95 is installed in an encode position.

6-2 MA-90 CIRCUIT DESCRIPTION (TONE DECODING CONDITION)

Refer to the Circuit Diagram, Figure 6-4. When point "D" is grounded, the module is in the decoding mode.

Audio from the receiver discriminator is fed into the tone squelch board at terminal L, and passes through the High Pass Filter IC601, and back to the receiver's audio amplifier circuits at terminal J. The high pass filter removes the CTCSS tones, which are below the normally utilized speech frequencies, so they will not be heard on the receiver loudspeaker.

Audio from the receiver discriminator (at L) is also fed into IC602, which contains a low pass filter, and a limiter amplifier. The low pass filter removes most of the speech and higher frequency noise components from the signal, leaving essentially only the CTCSS tone frequencies and low frequency noise components. This filtered signal is then passed to the combination of IC603 and IC604, which acts as a high Q band pass filter, tuned sharply to the wanted CTCSS tone. IC603 contains the tone determining portions of the combination, and IC604 contains the necessary amplifiers for the filter arrangement. If the received tone is the proper one, as determined by IC603, it will be present in the output of the IC603--IC604 combination. This tone then passes to IC605, which is a detector circuit that detects the presence (or absence) of a tone signal.

The IC605 output, is normally high, and goes to a low voltage upon receipt of tone. This output appears at terminal K to signify

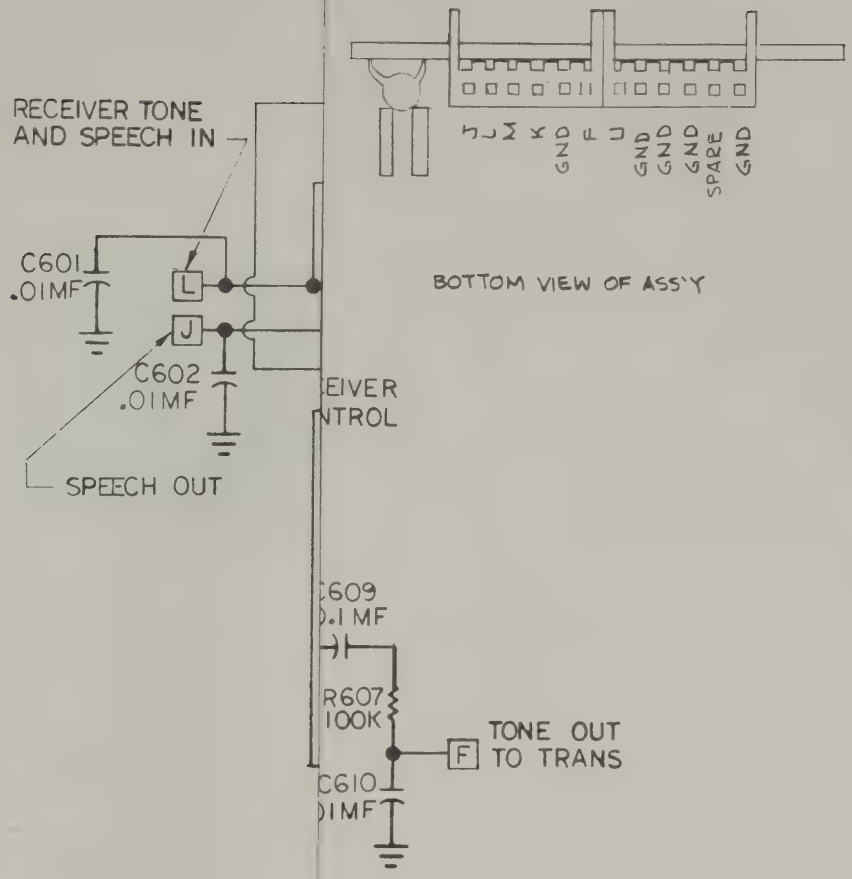
the receipt of a signal having the designated tone squelch frequency.

6-3 CIRCUIT DESCRIPTION, MA-95 ENCODER

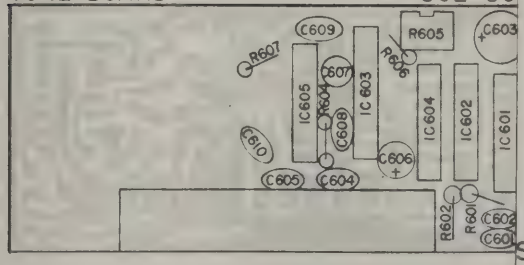
The MA-95 is an encode only version of the MA-90. Refer to the circuit diagram, Figure 6-5. The combination of IC603 and IC604 is an oscillator, with the frequency of oscillation being determined by the components in IC603.

The oscillation output of IC603, IC604 is fed to F, and thus to the modulation section of the transmitter.

The amplitude of the tone voltage sent to the transmitter is controlled by R605, which is the control for adjusting the amount of modulation deviation caused by the tone.



TONE BOARD 302-50



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00-215 FOR BASIC RADIO SCHEMATIC.
CONNECTION POINTS TO

E ENCODER-DECODER BOARD

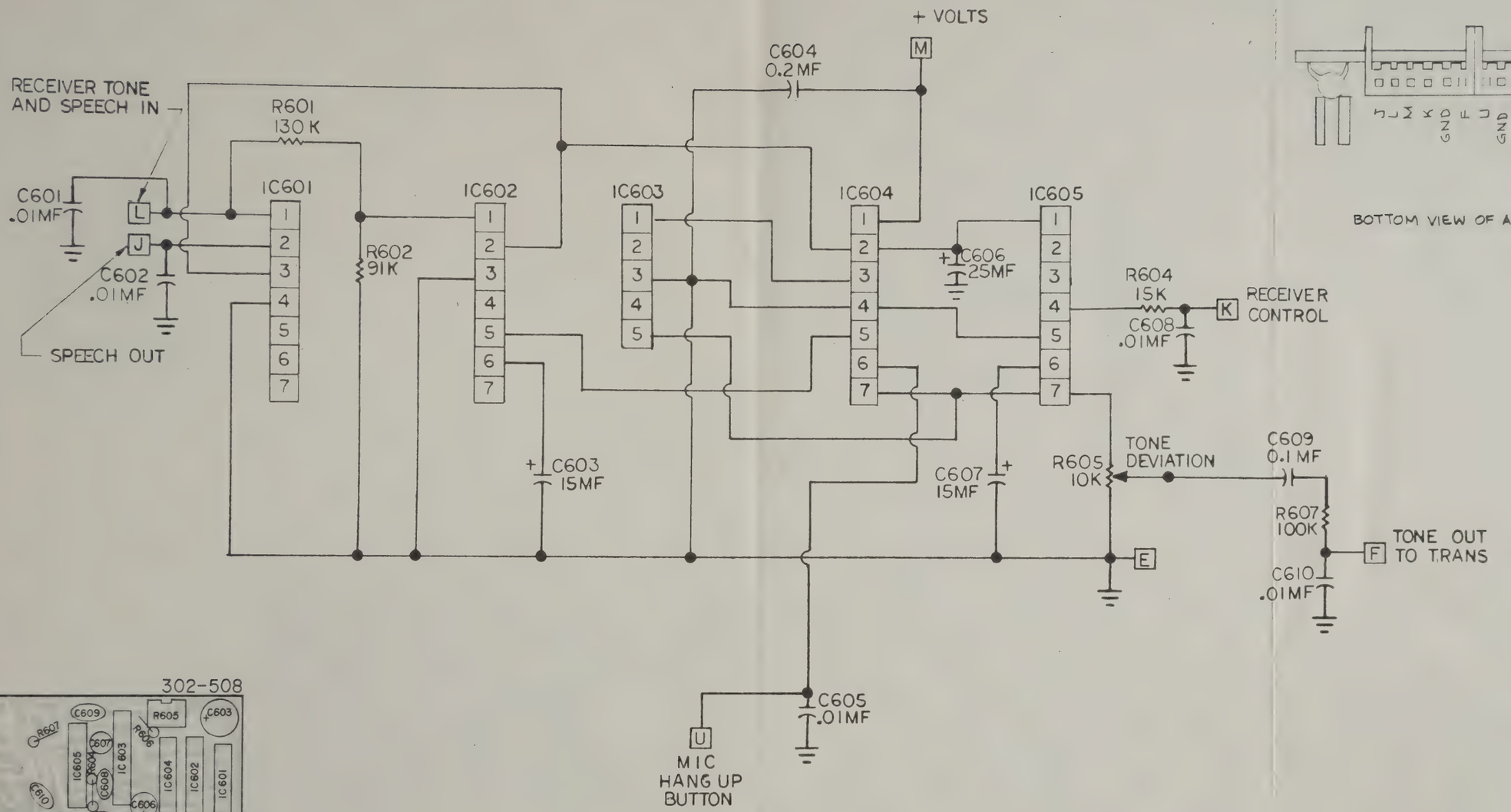
the receipt of a signal having the designated tone squelch frequency.

6-3 CIRCUIT DESCRIPTION, MA-95 ENCODER

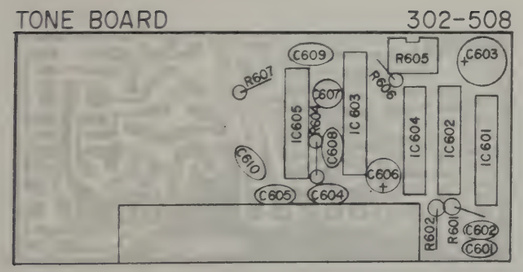
The MA-95 is an encode only version of the MA-90. Refer to the circuit diagram, Figure 6-5. The combination of IC603 and IC604 is an oscillator, with the frequency of oscillation being determined by the components in IC603.

The oscillation output of IC603, IC604 is fed to F, and thus to the modulation section of the transmitter.

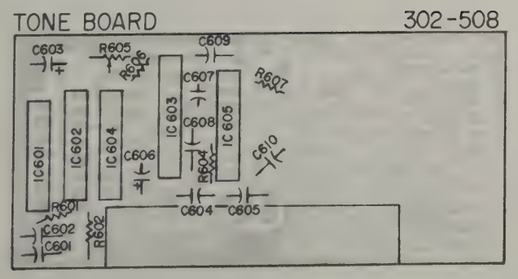
The amplitude of the tone voltage sent to the transmitter is controlled by R605, which is the control for adjusting the amount of modulation deviation caused by the tone.



TONE BOARD 302-508



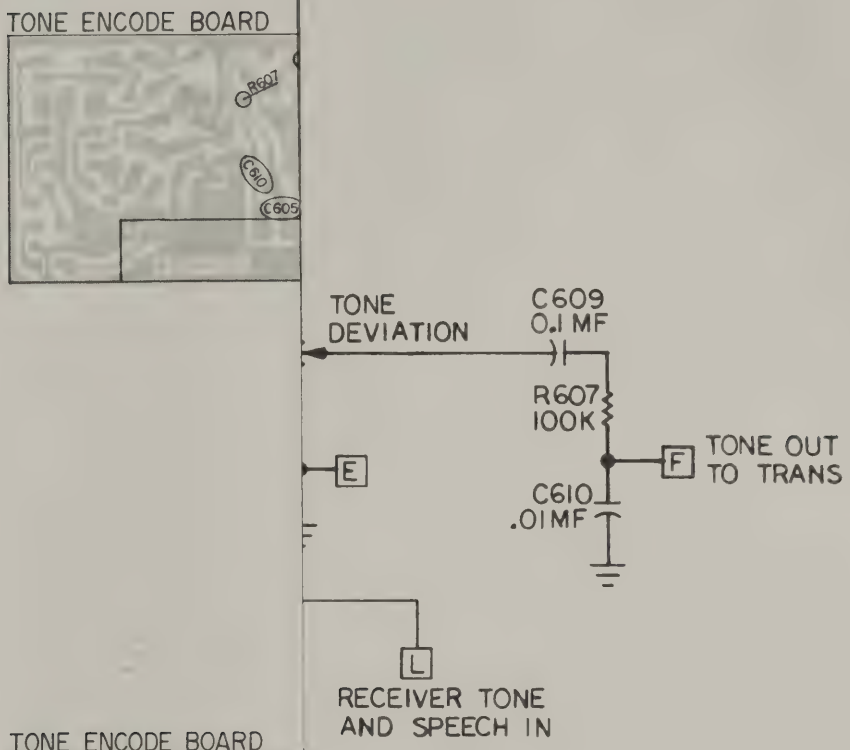
TONE BOARD 302-508

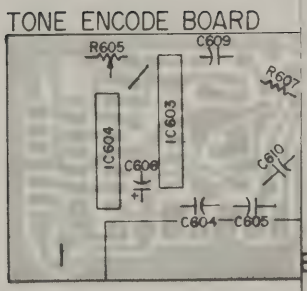


NOTES

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO FARADS.
   ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS.
2. REFER TO DRAWING 700-215 FOR BASIC RADIO SCHEMATIC.
3. LETTERED BOXES ARE CONNECTION POINTS TO DRAWING 700-215

6-4 MA-90 TONE ENCODER-DECODER BOARD





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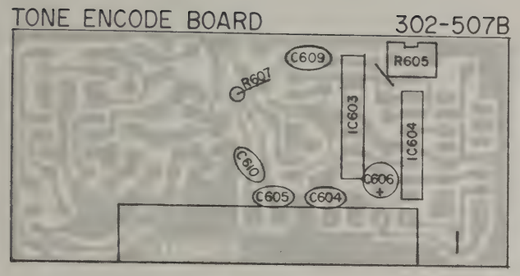
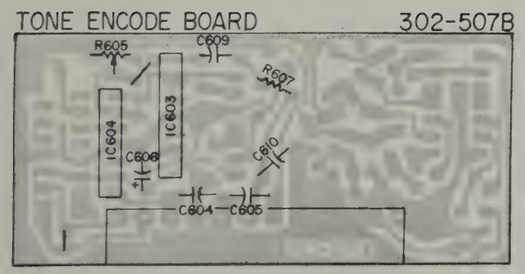
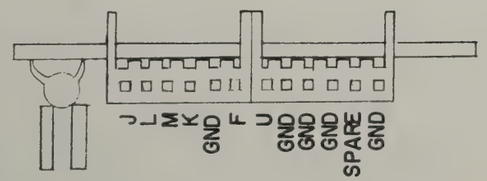
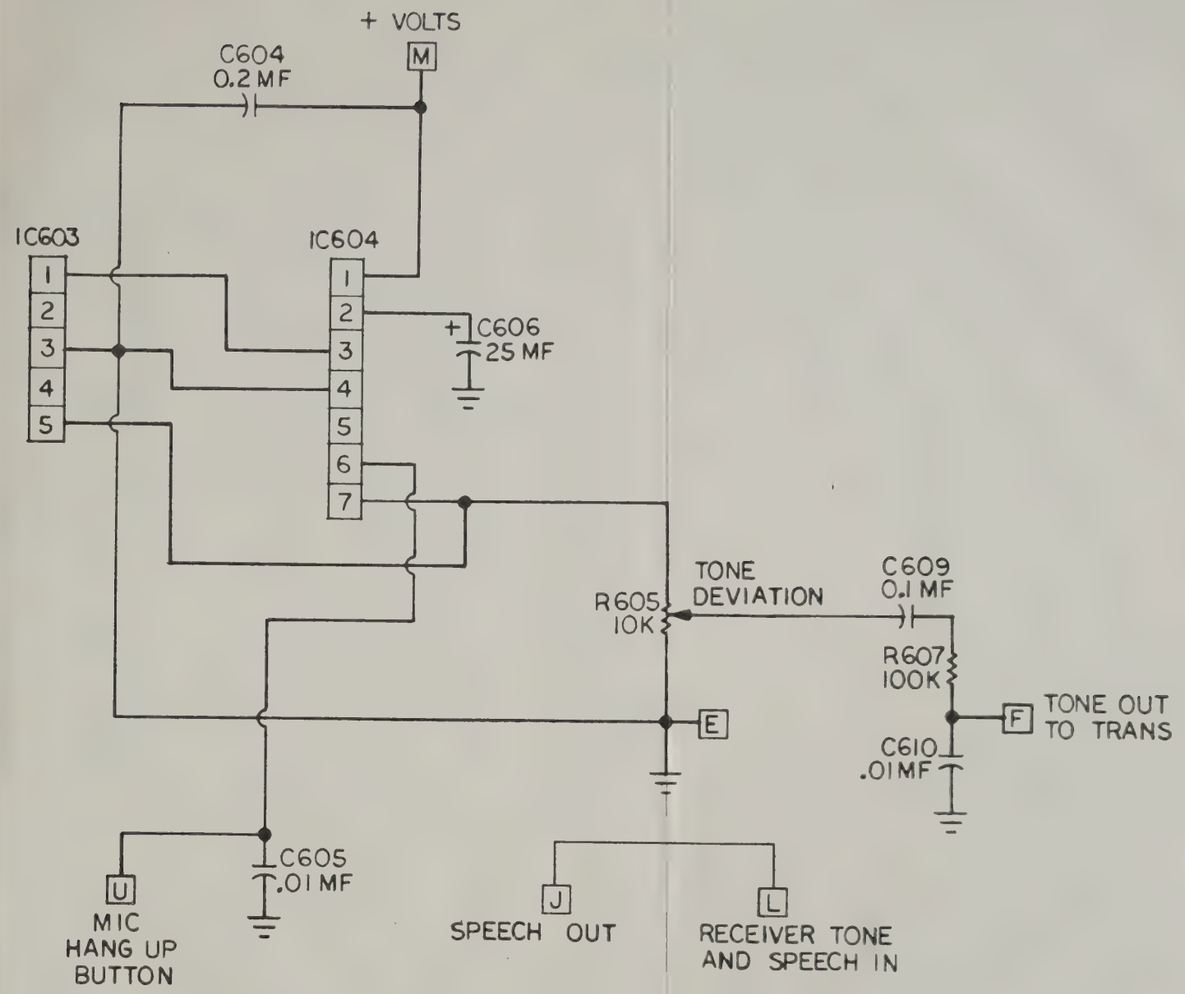
ONE ENCODER BOARD







BOTTOM VIEW OF ASSEMBLY



NOTES

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICA FARADS.
   ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS.

6-5 MA-95 TONE ENCODER BOARD

SECTION 6A

MA-116 TONE ENCODER-DECODER

&

MA-121 ENCODER

SECTION 6A MA-116 TONE ENCODER-DECODER, AND MA-121 TONE ENCODER

6A-1 GENERAL INFORMATION

The model MA-116 Tone Squelch Encoder-Decoder is used as a tone decoder for CTCSS (tone squelch) operation of the Regency MICRO-COM U10R repeater. Since the MA-116 can serve as either an encoder or a decoder, it can be used in either the encoder or decoder sockets of the U10R repeater.

The model MA-121 Tone Squelch Encoder is a simplified version of the MA-116 encoder-decoder, in which only those components needed for the encoding function are installed.

Normally, for each tone frequency accommodated by the MICRO-COM U10R repeater, one MA-116 is installed in a decoder position and one MA-121 is installed in an encode position.

6A-2 MA-116 ENCODER-DECODER CIRCUIT DESCRIPTION (Tone Receiving Condition)

Audio from the receiver discriminator is fed into the tone squelch board at terminal L, and passes through the High Pass Filter IC601A, and back to the receiver's audio amplifier circuits at terminal J. The high pass filter removes the CTCSS tones, which are below the normally utilized speech frequencies, so they will not be heard on the receiver loudspeaker.

Audio from the receiver discriminator (At L) is also fed into an active filter, consisting of IC601B, IC602A, and IC602B. This filter is a high Q, bandpass filter, that can be tuned for operation on any of the CTCSS tone frequencies. The components of the filter which determine the operating tone are precision resistors and condensers; R601, R602, R603, R604, R605, R606, R607, C601, and C602.

If the received tone is the proper one, as determined by the bandpass filter, it will be present in the output of IC602 and will be amplified by IC603, and then rectified to a D.C.signal by the tone rectifiers CR601 and CR602. This D.C. signal is then amplified further by the D.C. amplifier, IC603A. The output of IC603 is normally high, and goes to a low voltage upon receipt of proper tone. This output appears at terminal K, which connects to the corresponding terminal K on the receiver chassis, and is used to disable the receiver audio section when no tone is being detected.

6A-3 MA-121 ENCODER CIRCUIT DESCRIPTION

A block diagram of the of the encode only circuit board is shown on Figure 6A-7, and a circuit diagram is shown in Figure 6A-8.

The operating frequency of the tone system is controlled by

an Active filter, consisting of IC601B, IC602A, and IC602B. This filter is a high Q, bandpass filter, that can be tuned for operation on any of the CTCSS tone frequencies. The components of the filter which determine the operating tone are precision resistors and condensers; R601, R602, R603, R604, R605, R606, R607, C601, and C602.

IC603A is an integrated circuit operational amplifier, used as a limiting amplifier. It is connected between one of the inputs and one of the outputs of the active filter described above. This limiting amplifier thus serves as a feedback path which causes the total circuit to oscillate at a frequency determined by the active filter. The limiting action of IC603 serves to keep the level of oscillation from overloading the active filter, thus keeping the output from the active filter sinusoidal.

6A-4 TONE SETTING INSTRUCTIONS (MA-116 and MA-121)

The tone frequency is determined by (a) the insertion of jumpers to determine which of three bands of operation is desired, and (b) the adjustment of a precision potentiometer to determine the specific tone frequency.

For purposes of installing the jumpers, the total CTCSS frequency is divided into three bands, the low band being 67.0 Hz to 110.9 Hz; the middle band 114.8 Hz to 192.4 Hz, and the high band 203.5 Hz to 253.0 Hz.

INSTALL JUMPERS FOR THE PROPER BAND

Figure 6A-9 shows the jumper locations. Determine which band includes the desired frequency, and insert (or remove) jumpers according to the following chart:

67.0 Hz to 110.9 Hz	Low Band	JU601,JU602,JU603,JU604 are all removed.
114.8 Hz to 192.4 Hz	Middle Band	JU601,JU603 in place. JU602,JU604 removed.
203.5 Hz to 253.0 Hz	High Band	JU602,JU604 in place. JU603,JU605 removed.

After soldering or unsoldering jumpers, at least five minutes should elapse before making any final frequency adjustment. This is necessary to permit the precision resistors and capacitors in the vicinity of the soldering points to stabilize in temperature.

TONE SETTING PRECAUTIONS

Accurate frequency setting is necessary on CTCSS (tone squelch) systems. When making the above frequency adjustments, be sure that you set the tone as precisely as possible. If the tone board is to

operate in a system using reed type tone boards, be sure that your frequency setting is within .1 or .2 Hz if possible. Especially on reed tone systems, it is advisable to measure the tone frequency of several of the existing units; it is not safe to assume that the system is really operating on exactly the frequency stamped on the nameplates.

6A-5 ADJUSTMENT PROCEDURE (Setting Tone Receive Threshold on MA-116)

With the receiver in the receive condition, and the microphone hang up button grounded to the transceiver chassis, inject a signal of the appropriate channel frequency into the transceiver antenna jack, and modulate this signal with the wanted CTCSS tone frequency, with a deviation of plus and minus 200 Hz. Then, adjust R612 (on the tone board) until the signal just opens the tone squelch system, and allows the receiver audio to function,(See Fig. 6A-10).

After performing this adjustment of R612, check to be sure that the tone squelch will actually open when the tone deviation of the receive signal becomes as much as plus and minus 200 Hz. Further, check to be sure that noise bursts do not come through when the receiver is not receiving any incoming signal.

6A-6 ADJUSTMENT PROCEDURE (Setting Tone Modulation Deviation on MA-121)

Adjust R618, on the tone squelch board to obtain a tone modulation deviation of plus and minus 500 Hz. Then, insert a 100 millivolt, 1,000 Hz tone into pin four of the microphone jack, and adjust R240, (the transmitter deviation control on the transceiver) to obtain plus and minus 5 KHz peak modulation deviation. If R240 was changed much, remove the 1,000 Hz tone, and readjust R618 to obtain a tone squelch modulation deviation of plus and minus 500 Hz.

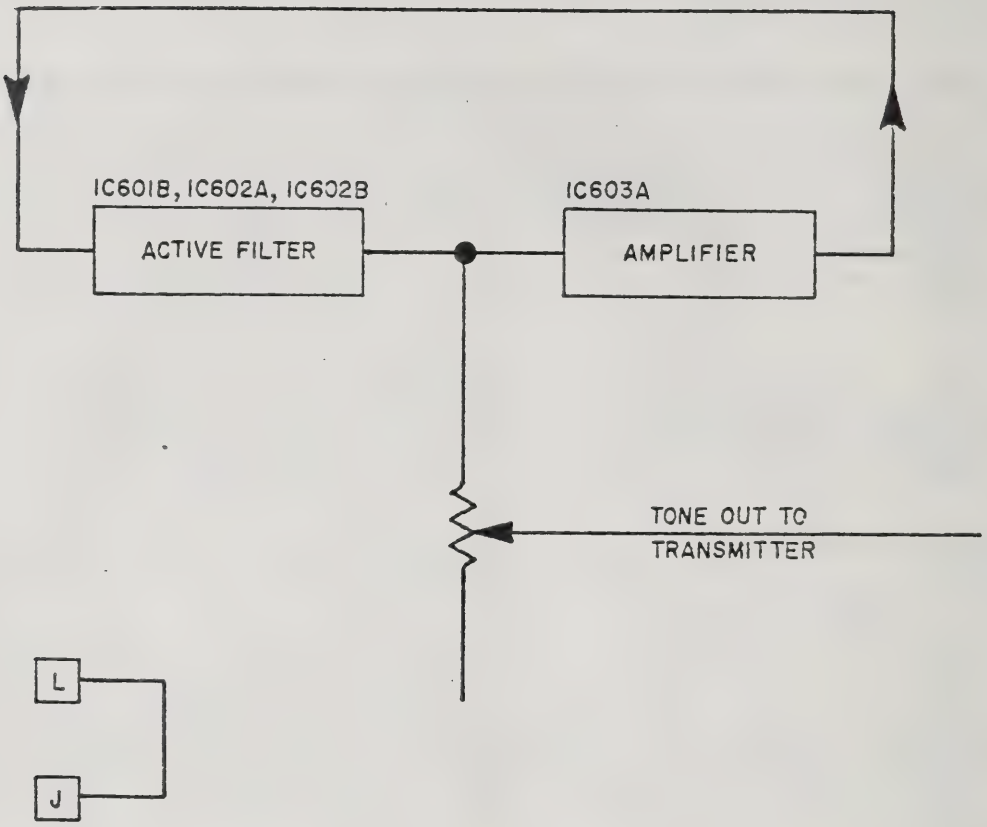


FIG 6A-7 BLOCK DIAGRAM

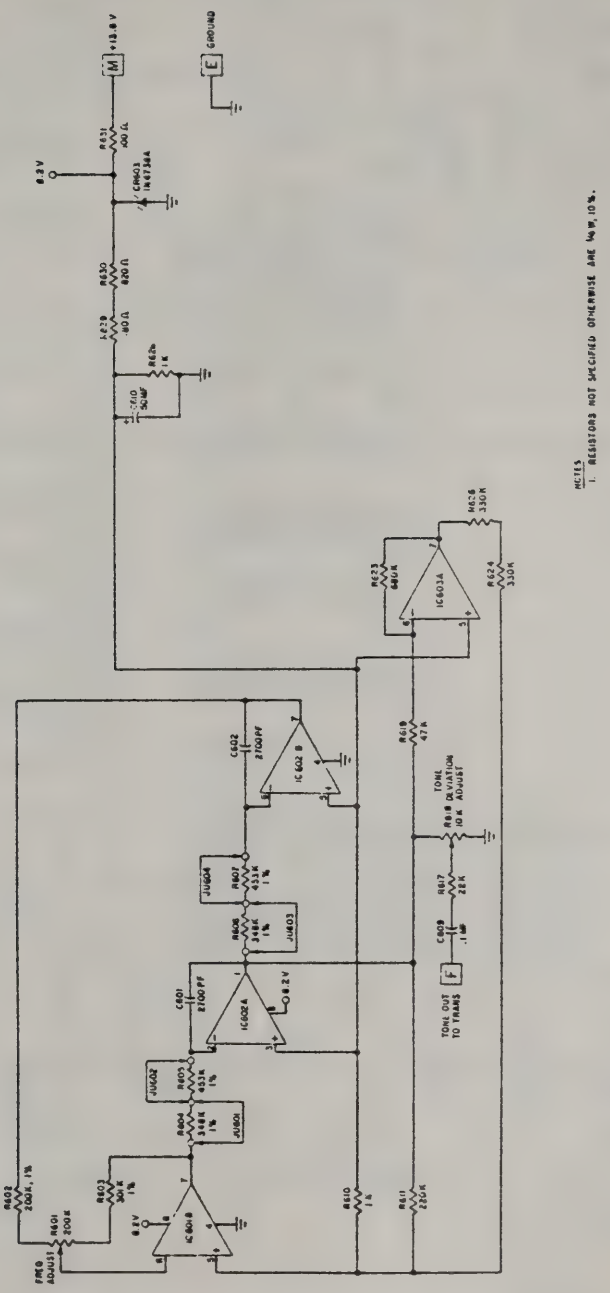
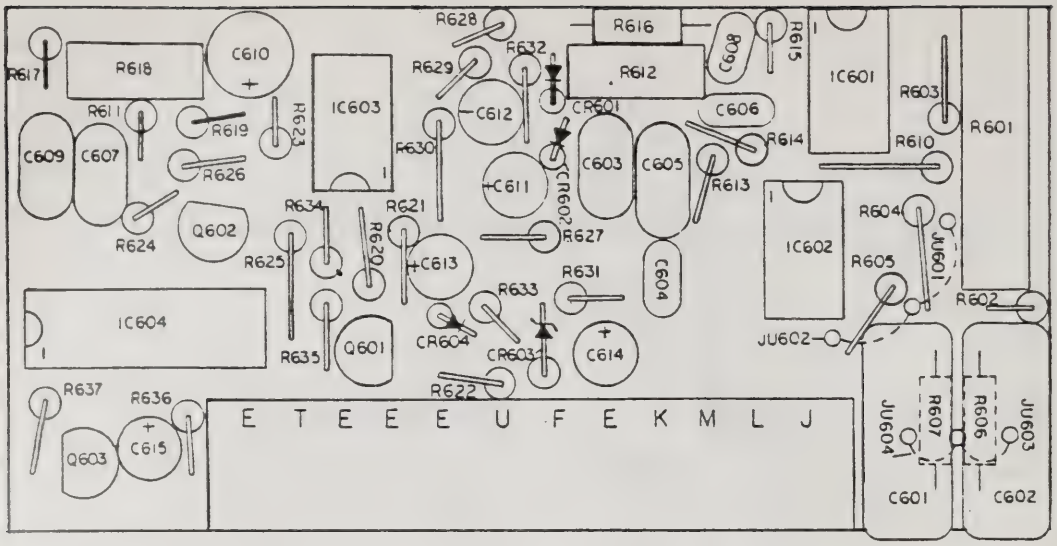
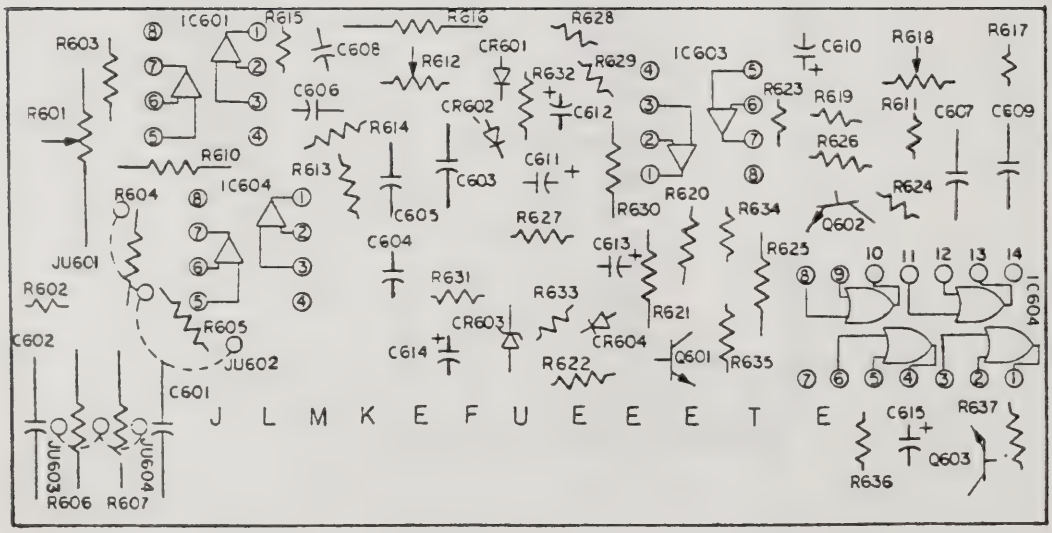


FIG 6A-8 SCHEMATIC

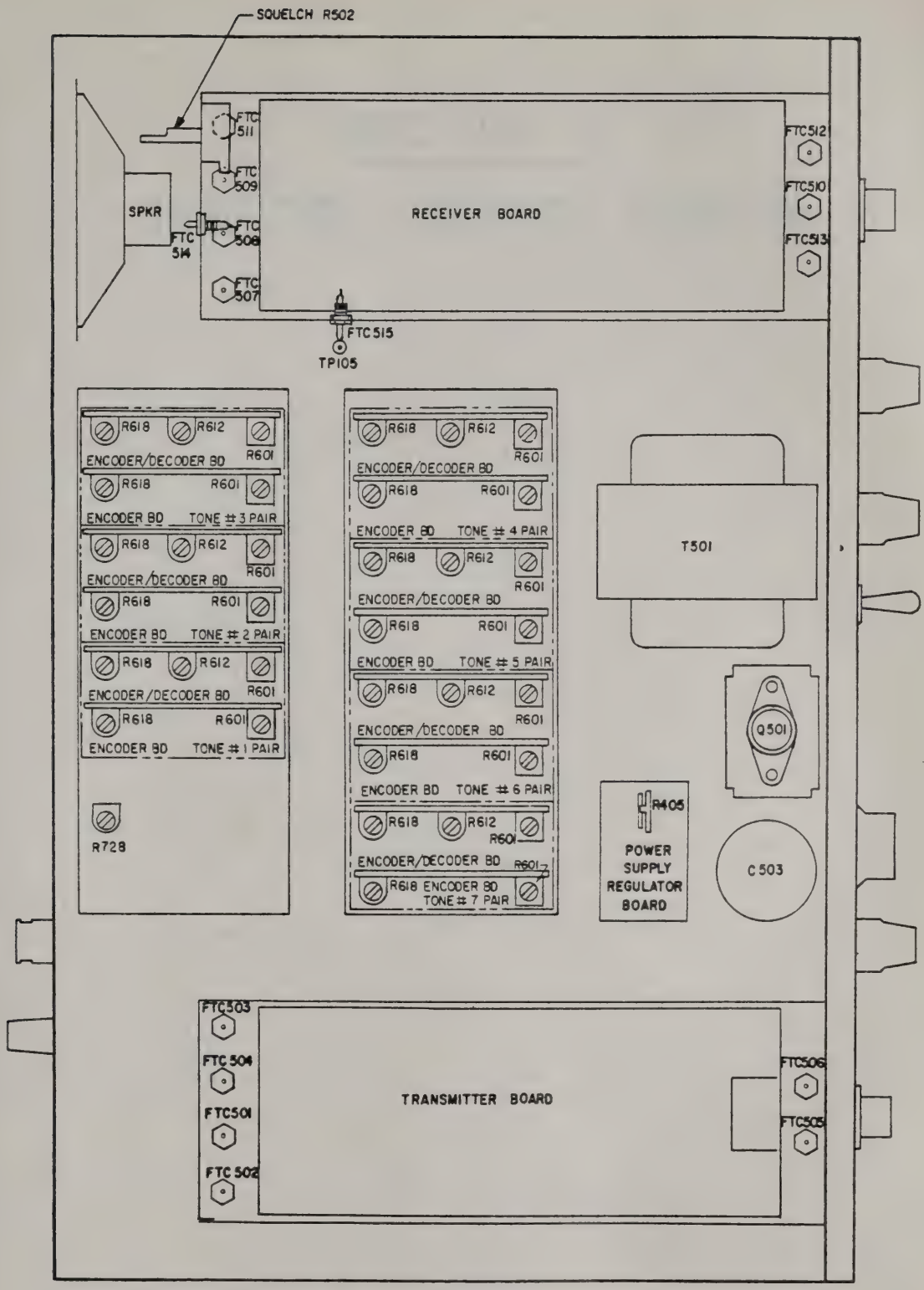


TOP VIEW



BOTTOM VIEW

FIG 6A-9



MA-116 & MA-121
6A-10 SETUP ADJUSTMENT LOCATIONS
TOP VIEW

SECTION 7

REPEATER CONTROL SYSTEM

SECTION 7 REPEATER CONTROL SYSTEM

7-1 REPEATER CONTROL BOARD

An interconnection schematic of the repeater is shown in Figure 7-10. The repeater control functions are performed by the repeater control board, which is shown in detail on the inter connection schematic. The control board components carry 700 series numbers. Follow Figure 7-10 while reading the following.

The control board is arranged to permit operation of the repeater by noise squelch, or by CTCSS (Continuous Tone Controlled Squelch, often abbreviated as "tone squelch") tones.

The U10R repeater is equipped to hold seven different tone decoders, three of these being accommodated on the repeater control board, and four on the auxiliary tone squelch board. Any number up to seven may be installed, but the first one should be installed in P706, located on the repeater control board. Similarly, the repeater is equipped to hold seven different tone encoders, three on the repeater control board, and four on the auxiliary tone squelch board. Any number up to seven may be installed, but the tone generator corresponding to the first tone encoder should be installed in P705.

7-2 AUDIO PATHS

Audio from the receiver is fed to Pin L of the tone receiver in the P706 receptacle. This audio contains both the speech and the CTCSS tone portions of the received signal. An active high pass filter removes those frequencies below about 300 Hz, which includes the CTCSS tones and feeds the remaining signal (now speech only) back to the receiver at Pin J. (In units not equipped with tone squelch, a jumper located on the circuit board adjacent to P701, provides a path between Pin J and L, and no low pass filter action is used.) This speech-only signal is then passed through the noise squelch controlled amplifier in the receiver and fed to the front panel volume control, R501. Audio from the arm of R501 is fed back to the receiver audio power amplifier and raised to loudspeaker levels to operate the local loudspeaker. Thus, R501 controls the volume heard by the local operator and has no effect on re-transmitted audio.

Receive audio, for retransmission, is taken from the high side of R501, passed through the transmitter modulation input control, R728, and sent to the transmitter modulation circuits. Since this audio has passed through the high pass filter in the tone squelch board, it contains only speech components, and does not contain any CTCSS tone. If CTCSS tone is used, the CTCSS tone for the retransmitted signal comes from the appropriate encoder board, as will be explained later.

7-3 TRANSMITTER ACTIVATION BY NOISE SQUELCH

When JU701 is connected to the "Squelch" contact pin, the transmitter will be activated by any signal that is accepted by the receiver's noise squelch system. When a signal is received and the receiver's noise squelch system causes the receiver to become unsquelched, audio amplifier Q113 in the receiver draws current through R501, the front panel volume control. This current creates a drop across R727 that causes Q708 to conduct. Q708 causes Q707 to conduct, which places an effective ground on the cathode of CR712, which causes Q709 to conduct, which then causes Q706 to conduct. Q706 places an effective ground on the PTT terminals of the transmitter, and therefore activates the transmitter.

Squelch Hysteresis Action:

When the transmitter is activated and Q709 is in a conducting condition, Q709 causes Q710 to also be conducting, placing the collector of Q710 near ground potential. The series combination of CR720 and R675 are connected between the K line to the receiver squelch and the collector of Q710. When Q710 conducts, its collector, acting through CR720 and R765, pulls the receiver squelch K line toward ground, forcing the receiver noise squelch into a more "unsquelched" condition. This action prevents the dropout of weaker signals from mobiles when the mobiles pass through low signal areas. The effect of this circuit is to add a large amount of "hysteresis" to the operation of the squelch system. That is, the signal required to hold the squelch open (once energized) is thus less than that required to open the squelch in the first place.

In some systems, it may be found that this "hysteresis" action is excessive, and permits unduly noisy signals to hold the repeater transmitter on. The amount of hysteresis action may be reduced by increasing the size of R765.

7-4 TRANSMITTER ACTIVATION BY CTCSS (TONE SQUELCH)

When JU701 is connected to the "tone" contact pin, the receiver noise squelch is no longer in control of the activation of the transmitter. In this condition, tone decoders, tuned to specific subaudible tones, activate the transmitter when the appropriate tone is detected on a received signal.

To follow the operation under tone squelch (CTCSS) control, assume that a tone decoder board for 127.3 Hz had been installed in the P706 connector of the repeater control board, and that a tone encoder for the same frequency has been installed in the corresponding P705 connector, also on the repeater control board. Also assume that JU703, a wire jumper on the circuit side of the circuit board adjacent to P706, has been removed.

Unsquelched audio from the receiver is connected to Pin L of all of the CTCSS tone receivers. When no tone is being received,

Pin K of all tone receivers will have a positive voltage causing Q702, Q705, Q706, Q802, Q804, Q806 to be conducting, and Q701, Q703, Q705, Q801, Q803 to be non-conducting. When a signal with 127.3 Hz tone is received, the 127.3 Hz tone receiver in P706 will sense the presence of the tone, and the positive voltage will disappear from its K terminal, causing Q706 to be non-conducting, thereby causing Q705 to be conducting. Current pulled by the collector of Q706 pulls current through LD703 and CR712, causing LD703 to light, and causing Q709 to conduct. The conduction of Q709 eventually causes the transmitter to be activated in the same manner as it would be in the noise squelch operation mode described earlier.

The conduction of Q709 also causes Q710 to conduct, placing its collector near ground potential. The series combination of CR720 and R675 are connected between the K line to the receiver squelch. When Q710 conducts, its collector, acting through CR720 and R765, pulls the receiver squelch into a more "unsquelched" condition. This action prevents the dropout of weaker signals from mobiles when the mobiles pass through low signal areas.

When no CTCSS tones are received, the cathodes of CR709 and CR710 are held at a positive voltage by R719. CR709 and CR710 constitute a diode switch. In this condition, the switch is open, preventing the output of the tone encoder (Pin F, P705) from reaching the transmitter tone input terminal F. Similar diode switches prevent the output of other tone encoders from reaching the transmitter tone input. When a 127.3 Hz tone is received, the action of the tone receiver board located in P706, and the action of Q806 and Q705 cause the voltage on the cathodes of switch diodes CR709 and CR710 to disappear. The diodes are then forward biased by current through R715 and R716, and therefore will conduct the tone from the P705 tone generator to reach the tone input to the transmitter.

7-5 OPERATION BY LOCAL MICROPHONE, PTT FUNCTION

The local microphone may be used for dispatching from the repeater location, or for testing the repeater station during maintenance procedures. The microphone supplied is a model MA-83. This is a ceramic type microphone with a switch section that disconnects the microphone element when the PTT switch is released.

One pole of the microphone PTT switch is connected to Pin 3 of the microphone connector J501. Inside the transmitter, Pin 3 goes to the coil of the PTT relay. Since the other side of this relay is connected to plus 13 volts, approximately 13 volts appears at Pin 3 of the microphone jack. This voltage acting through CR718, causes Q718 to be conducting. When the PTT switch is closed, the voltage at Pin 3 drops to zero, causing Q718 to become non-conducting, which results in a positive voltage appearing on the Q718 collector. This voltage, acting through R751, is connected to

the base of the receiver noise rectifier filter, causing the receiver to become squelched, and thereby preventing the retransmission of any received audio during the time the local microphone is depressed.

If the repeater is equipped with tone, the tone select test lead JU103 is normally connected to contact TP703. When the microphone button is depressed, TP703 is pulled almost to ground, causing CR709 and CR710 to conduct, thereby permitting the tone generated by the tone encoder in P705 to be delivered to the transmitter tone input. Thus, the 127.3 Hz tone assumed above will be transmitted when the local microphone switch is operated.

If it is desired to actuate other tones for test purposes, the Tone Select lead JU103 may be connected to the appropriate tone selection contact for the desired tone, i.e., TP701, TP702, TP801, TP802, TP803, TP804. When the microphone PTT switch is activated, the CTCSS tone associated with the selected contact will be transmitted. After the test, be sure to return JU103 to TP703 for normal operation.

7-6 TONE MONITORING PROVISIONS

Assuming that the tone select test lead is connected to TP703, and that a 127.3 Hz tone decoder is plugged into P706, the positive voltage of Pin K of P702 (under the no-tone received condition), acting through R759 and R560 causes the diode audio switch consisting of CR719 and CR720 to block audio from the arm of the front panel volume control R501, preventing audio from reaching the receiver audio power amplifier, and the local loudspeaker.

When a tone of 127.3 Hz is received, TP703 is no longer positive, and the diode audio switch CR719-CR720 is switched to the pass condition, permitting the received audio signal to pass from the arm of the front panel volume control to the receiver audio power amplifier and thus the signal can be heard over the local loudspeaker. Note that this received audio must pass through the noise squelch circuit of the receiver as well as audio switch CR719 and CR720.

The above has described the operation when the microphone is in its grounded hanger. When the microphone is in its hanger, only signals bearing the specific tone installed in P706 will be heard in the loudspeaker. The microphone hang-up button is connected through the microphone cable to Pin 5 of the microphone connector J501, placing a ground on the base of Q717, which causes Q717 to be non-conductive. Under this condition, only the signals bearing the 127.3 Hz tone assumed above will be heard in the local loudspeaker, as described above.

When the microphone is lifted from its hanger, the base of Q717 is pulled positive by R749, causing Q717 to conduct, forcing the diode switch CR719-CR720 to be in the pass condition, regardless of the voltage coming from TP703. Under this condition, referred to as the "MONITOR" condition, all audio signals that pass through the receiver noise squelch system will be passed on to the receiver audio amplifier and the local loudspeaker. This "MONITOR" condition permits the operator to listen on the channel before transmitting, and thus avoid breaking up an ongoing communication on the channel.

Summarizing the action of the microphone hang-up button, and its monitoring actions:

When the microphone is in its hanger, all received signals with appropriate tone squelch frequencies (those for which a tone decoder has been installed) will be retransmitted by the repeater, but only those signals bearing one specific tone (selected by the placement of the tone-select test lead, JU703) will be heard in the local loudspeaker. This enables the local operator to avoid being bothered by transmissions over the repeater which do not concern him.

When the microphone is removed from its hanger, all received signals, regardless of whether they have the correct tone, or any tone, will be heard in the local loudspeaker. This permits the operator to monitor activity on the channel before transmitting.

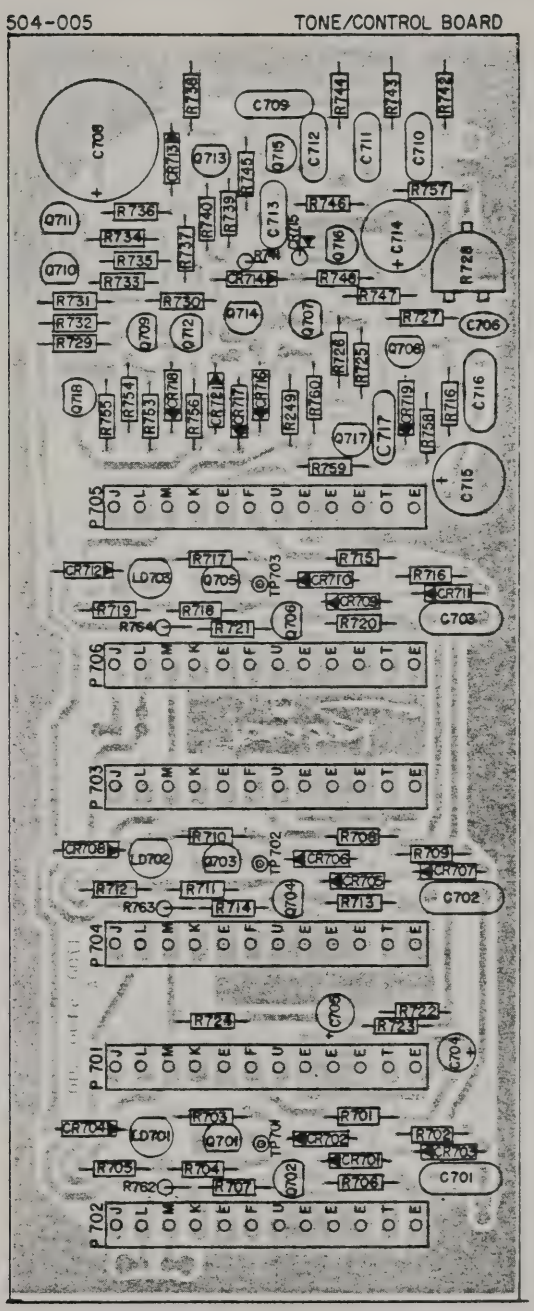
7-7 THREE MINUTE TIMER, DROP-OUT DELAY, TIME-OUT WARNING OSCILLATOR

When the transmitter is not activated, Q709 is non-conducting, causing Q710 to be non-conducting, causing Q711 to be conducting.

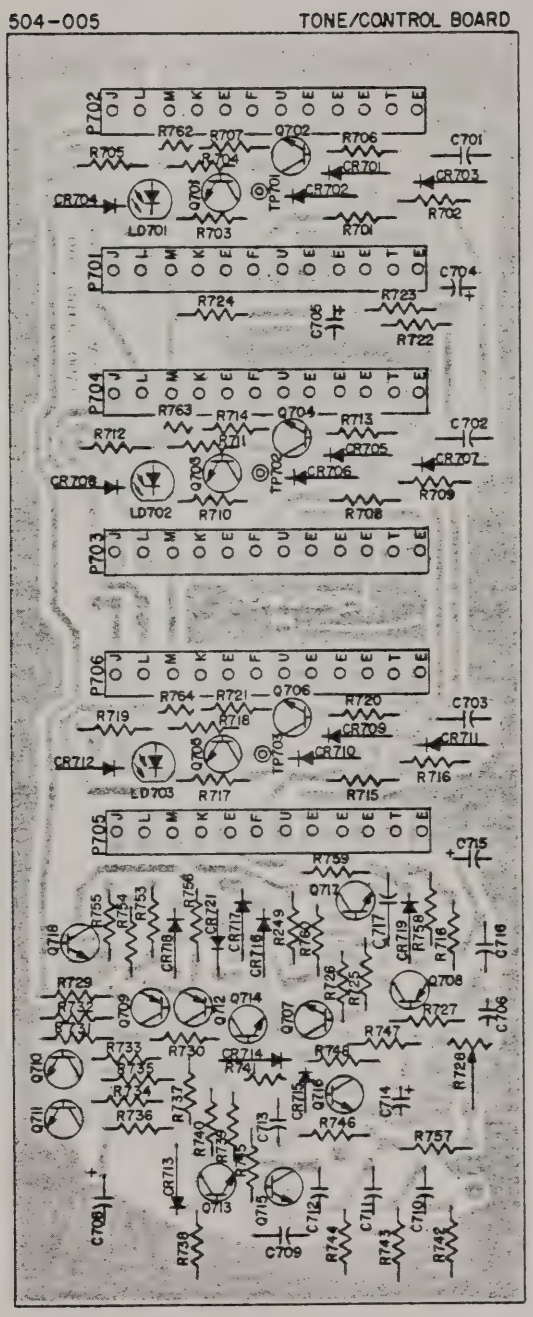
Since the collector of Q711 is shunted across timing condenser C708, C708 cannot be charged through R735. When the transmitter is activated by the receipt of a signal, Q710 is turned on which makes Q711 non-conducting, thus removing the short across C708. C708 then is slowly charged through R735. When C708 becomes charged to about 1.2 volts, it causes Q713 to conduct. Once Q713 begins conduction, it turns on Q712 which puts more base current into Q713, causing it to conduct heavily and turn on Q714. Q714 acts as a short across the line leading to the base of Q716, turning Q716 off. Since Q716 collector is connected to the PTT lead of the transmitter, the short it creates between this lead and ground is removed, and the transmitter turns off as soon as the drop-out delay capacitor C714 is discharged.

When Q713 becomes conductive, it also supplies collector current to the time-out warning oscillator, Q715. Q715 is connected as a phase shift oscillator and its output is connected into the transmitter modulation input. The beep from the time-out warning oscillator is transmitted during the few seconds of the drop-out

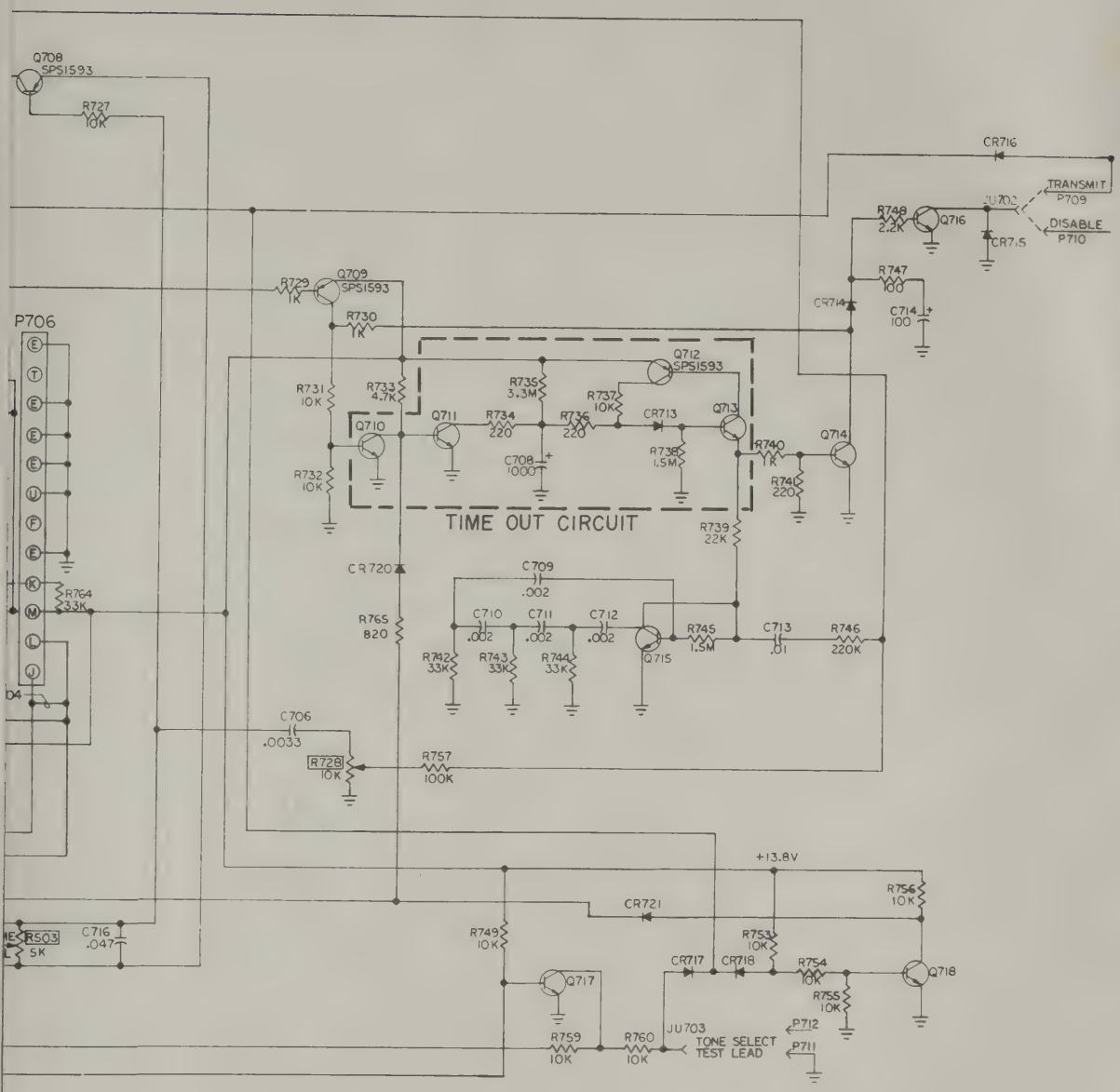
delay caused by C714. C714, in the base circuit of Q716 serves as a "drop-out delay." While the transmitter is turned on, C714 becomes charged. When the received signal disappears, the charge on C714 holds Q716 in conduction for about two seconds. Thus, the transmitter remains activated for about two seconds after the received signal disappears.



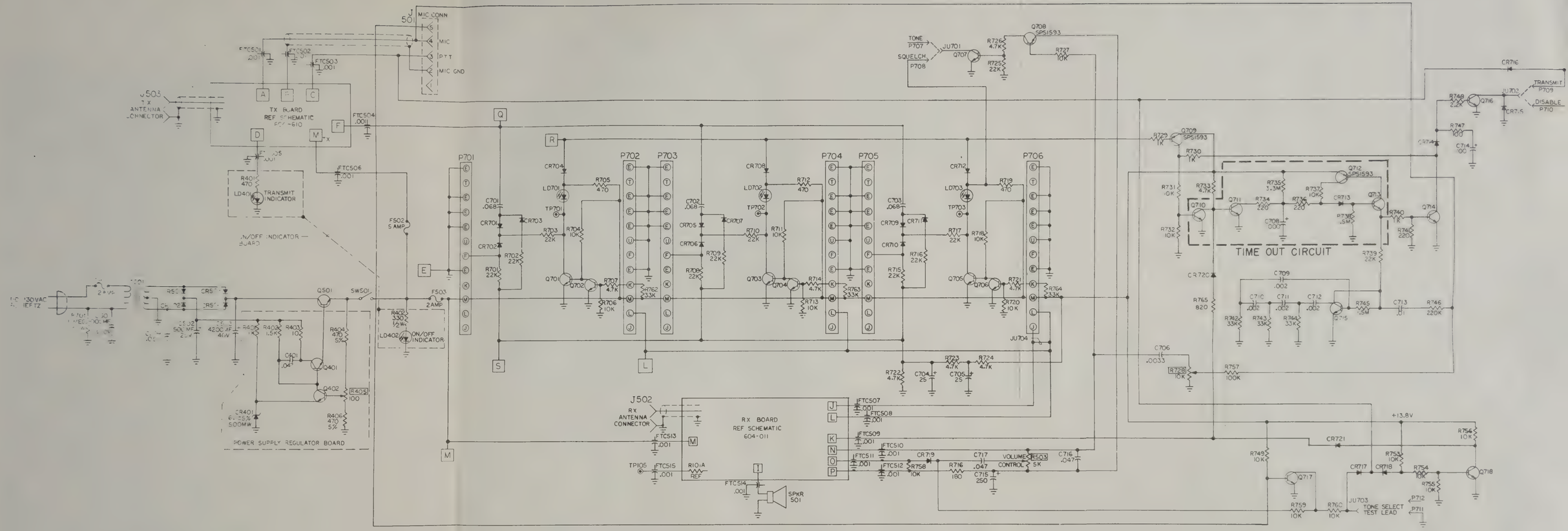
7-8 REPEATER CONTROL BOARD TOP VIEW



7-9 REPEATER CONTROL BOARD BOTTOM VIEW



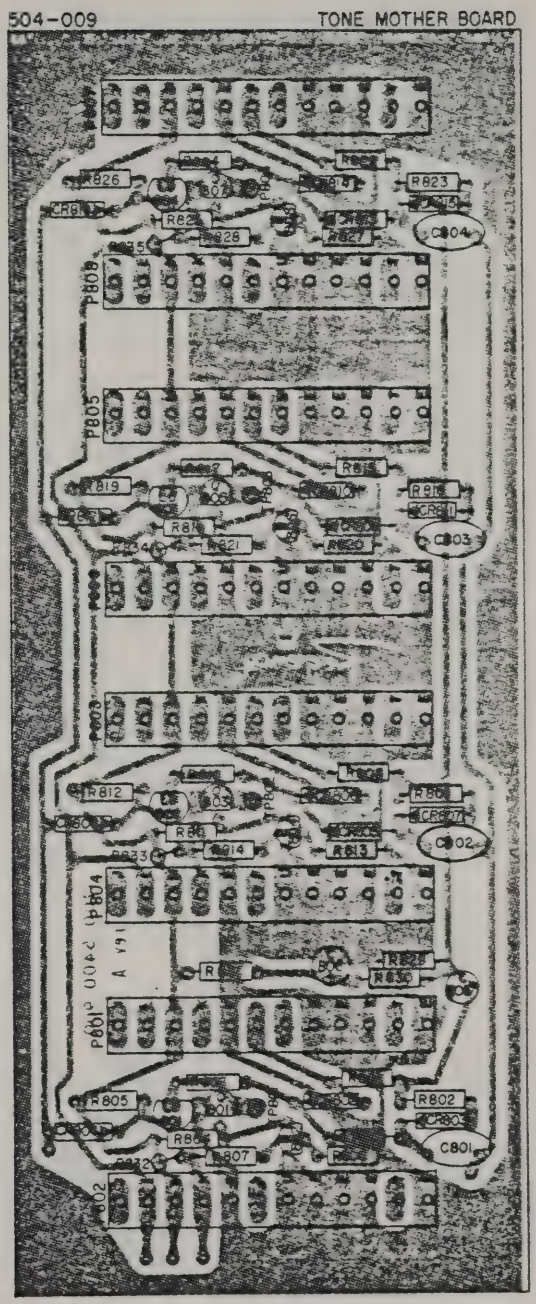
7-10 REPEATER INTERCONNECTION SCHEMATIC INCLUDING REPEATER CONTROL BOARD



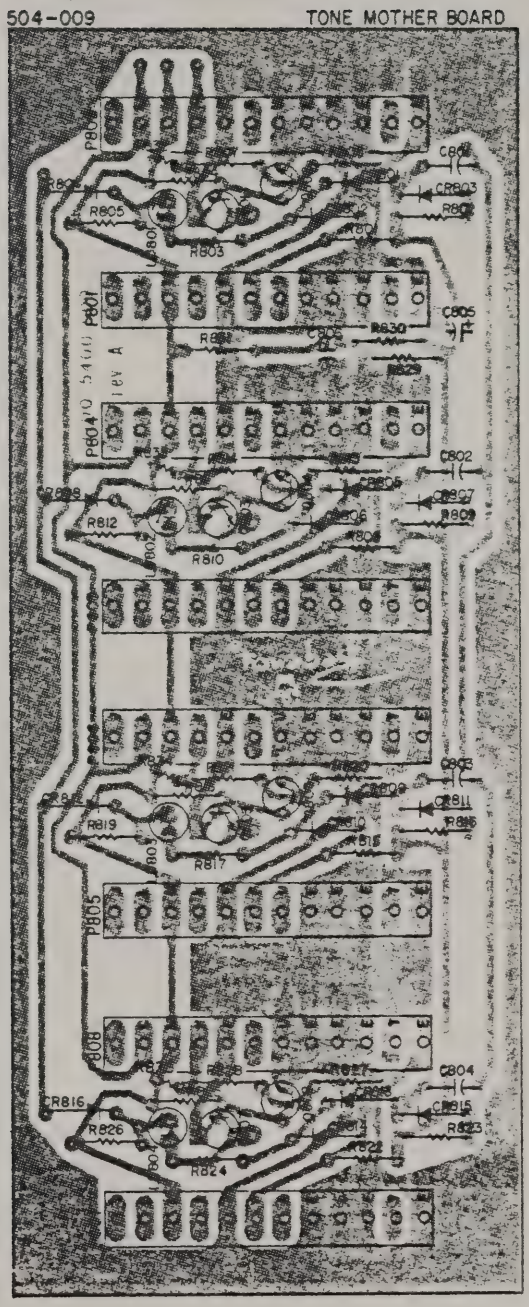
NOTES

1. ALL RESISTORS ¼ W UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS ARE MICROFARADS UNLESS OTHERWISE NOTED.
3. ▭ DENOTES ADJUSTABLE COMPONENTS.
4. HEAVY LINE DENOTES APPARENT SIGNAL FLOW.
5. ALL VOLTAGES (FIGURES IN PARENTHESIS) ARE NOMINAL VALUES AS MEASURED WITH A VTVM. SUPPLY VOLTAGE = 117 VAC 60 HZ AT INPUT TO SUPPLY CABLE.
6. PART DESIGNATION NUMBERS INDICATE LOCATION.
   - 100 SERIES R_x BOARD REF SCHEMATIC 604-011.
   - 200 SERIES T_x BOARD REF SCHEMATIC 604-010.
   - 300 SERIES UNASSIGNED.
   - 400 SERIES
     - (a) POWER SUPPLY REGULATOR BOARD
     - (b) ON/OFF INDICATOR BOARD
   - 500 SERIES CHASSIS MOUNTED.
   - 600 SERIES
     - (a) TONE PLUG-IN MODULE (ENCODE/DECODE) REF SCHEMATIC 501-275
     - (b) TONE PLUG-IN MODULE (ENCODE ONLY) REF SCHEMATIC 304-007.
   - 700 SERIES TONE CONTROL BOARD.
   - 800 SERIES TONE MOTHER BOARD REF SCHEMATIC 604-009

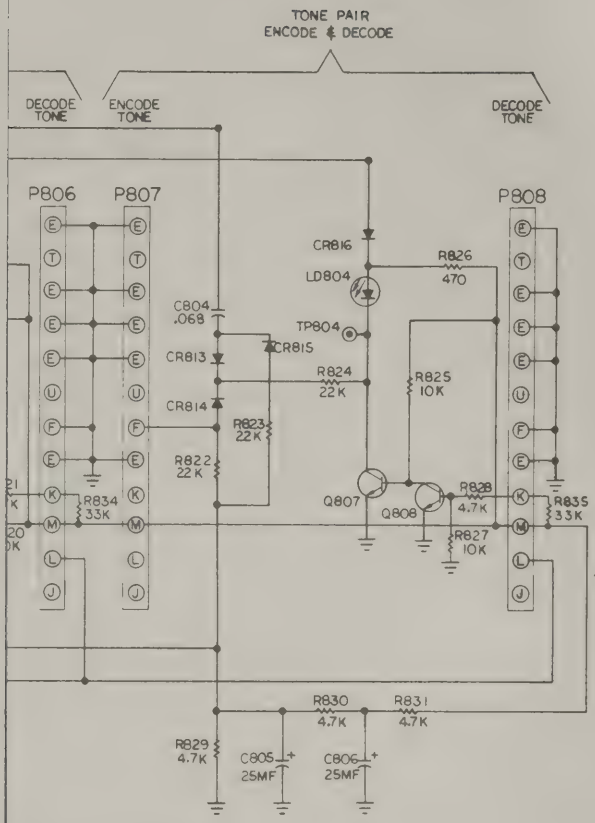
7-10 REPEATER INTERCONNECTION SCHEMATIC INCLUDING REPEATER CONTROL BOARD



7-11 AUXILIARY TONE BOARD TOP VIEW

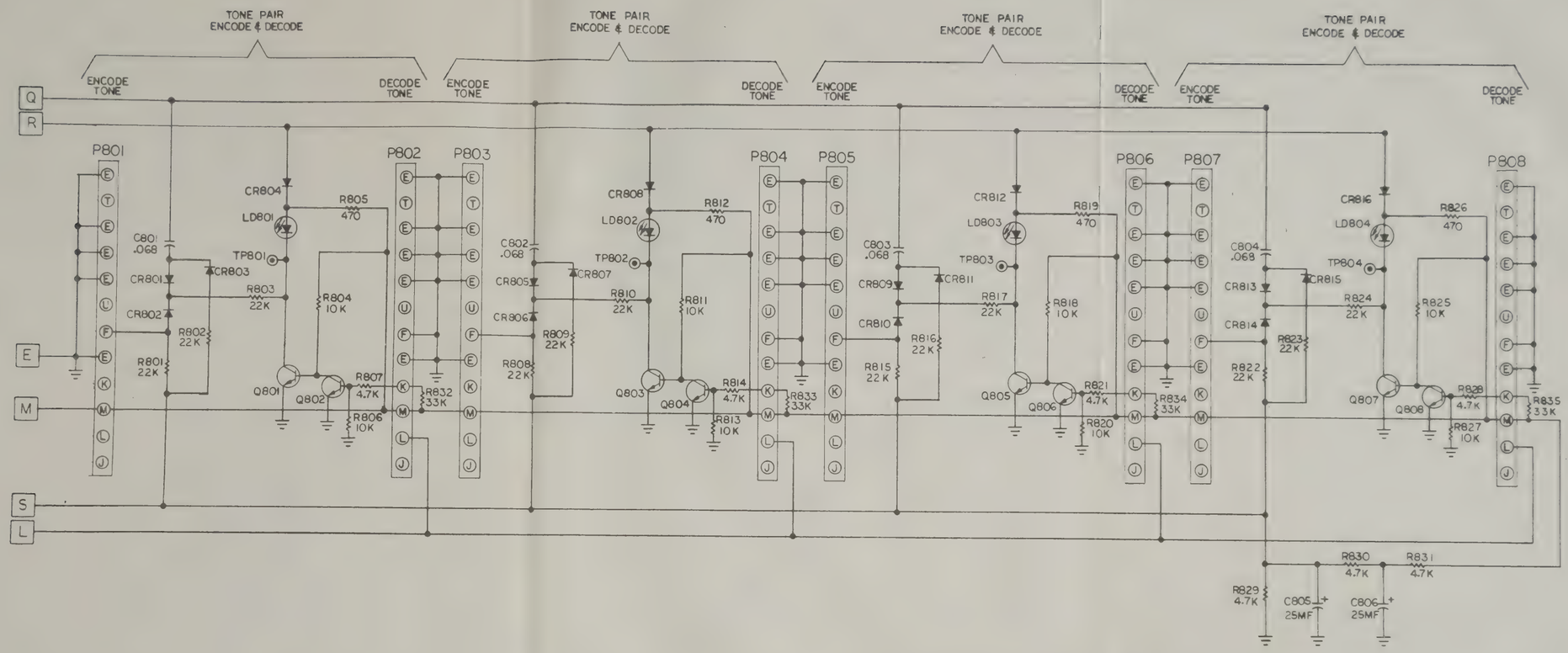


7-12 AUXILIARY TONE BOARD BOTTOM VIEW



RS ARE ¼W, 10%.
ORS ARE IN MICRO FARADS.
TORS ARE SPS952.
ARE IN4148.
805 AND P807 ARE
ED ON SCHEMATIC 304-007.
806 AND P808 ARE
ED ON SCHEMATIC 501-275.
SPONDING TIE POINTS

RY TONE BOARD SCHEMATIC



1. UNLESS OTHERWISE NOTED, ALL RESISTORS ARE ¼W, 10%.
2. UNLESS OTHERWISE NOTED, ALL CAPACITORS ARE IN MICRO FARADS.
3. UNLESS OTHERWISE NOTED, ALL TRANSISTORS ARE SPS952.
4. UNLESS OTHERWISE NOTED, ALL DIODES ARE IN4148.
5. CIRCLED LETTERS FOR P801, P803, P805 AND P807 ARE CORRESPONDING TIE POINTS REFERENCED ON SCHEMATIC 304-007.
6. CIRCLED LETTERS FOR P802 P804 P806 AND P808 ARE CORRESPONDING TIE POINTS REFERENCED ON SCHEMATIC 501-275.
7. LETTERS WITHIN SQUARES ARE CORRESPONDING TIE POINTS REFERENCED ON SCHEMATIC 704-002.

7-13 AUXILIARY TONE BOARD SCHEMATIC

ON/OFF BOARD 302-485

BOTTOM VIEW

ON/OFF BOARD 302-485

TOP VIEW

7-14 L.E.D. BOARD

7-15 REPEATER CONTROL BOARD AND AUXILIARY TONE BOARD VOLTAGES

REPEATER SETUP FOR TONE SQUELCH OPERATION

		No Signal Received, Trans Off	Signal Received, Trans On	Same, After Time-Out	Transmitter Turned On By Local Mike
Q701(Q703,Q705)	e	0	0	0	0
	b	0	.9	.8	0
	c	12	.15	.15	.8
Q702(Q704,Q706)	e	0	0	0	0
	b	.65	0	0	.65
	c	0	.2	.8	0
Q707	e	0	0	0	0
	b	.72	.72	.72	.72
	c	0	0	0	0
Q708	e	9	9	9	9
	b	8.4	8.4	8.4	8.4
	c	9	9	9	9
Q709	e	13	13.5	13.5	13
	b	13.2	12.6	12.5	13.2
	c	0	13.3	13.3	0
Q710	e	0	0	0	0
	b	0	.7	.7	0
	c	.8	.01	0	0
Q711	e	0	0	0	0
	b	.8	0	0	.8
	c	0	.2	13	0
Q712	e	14	13.5	13.5	14
	b	13.5	13	12.8	13.5
	c	14	13.5	13.5	14
Q713	e	0	0	11.8	0
	b	0	0	12.2	0
	c	13.5	13.5	13	13.5
Q714	e	0	0	0	0
	b	0	0	.82	0
	c	10	10	.08	0

REPEATER SETUP FOR TONE SQUELCH OPERATION(cont.)

		No Signal Received, Trans Off	Signal Received, Trans On	Same, After Time-Out	Transmitter Turned On By Local Mike
Q715	e	0	0	0	0
	b	0	0	.5	0
	c	0	0	6.2	0
Q716	e	0	0	0	0
	b	.001	.72	.45	1.1
	c	13	0	13.6	.3
Q717	e	0	0	0	0
	b	.75	.7	.74	.75
	c	12.8	0	0	0
Q718	e	0	0	0	0
	b	.7	.7	.7	.3
	c	0	0	0	11.4
TP701(TP702, TP703,TP801, TP802,TP803, TP804)*		13	.15	.15	.15

*Reading on socket or T.P. of tone receiver for tone being received.

SECTION 8

REPEATER SETUP INSTRUCTIONS

SECTION 8 REPEATER SETUP INSTRUCTIONS

Assuming that the receiver and transmitter are tuned properly to their respective channels, and that the antenna system, with its duplexers and/or filters has been properly installed and tuned, the following instructions should be followed to set the repeater into operation.

8-1 PREPARATION FOR NOISE SQUELCH OPERATION

In this type of operation, no tone boards are installed in the tone receptacles, and the transmitter is activated by any signal that operates the receiver noise squelch system.

1. Check to see that Jumper JU704 is connected in place. JU704 is located on the circuit board near P706, and goes from Pin L to Pin J of P706.

2. Connect the "Tone Test Select Lead," JU703 (Blk) to the "ground" pin P711.

3. Connect JU701 (Yel) to the "Squelch Operate" pin P708.

4. Adjacent to each of the tone decoder plugs, P702, P704, P706, P802, P804, P808, there must be a 33,000 ohm "pull-up" resistor, connected to Pin M and Pin K of the connector. Be sure that these are in place.

Turn up the front panel volume control so you can hear the receiver in the local loudspeaker. The transmitter should now be activated whenever a signal opens the noise squelch, or if the noise squelch is put into the noisy condition by a setting of the squelch control. Note that the transmitter will be automatically turned off if the noise squelch system has held it on continuously for about three minutes. Also, note that the transmitter does not turn off instantly after the noise squelch silences the receiver. About three seconds of delay is provided by C714.

8-2 AUDIO LEVEL SETTING, NOISE SQUELCH OPERATION

The proper setting of audio levels is very important in the repeater operation. Excessive audio level settings can cause the performance of the repeater to be seriously degraded and can make the repeater transmissions sound noisy and distorted. It is recommended that the following procedures be followed, without any attempts at shortcuts.

1. The transmitter modulation deviation control, R240, located on the transmitter chassis should be set as follows:

Inject a 100 millivolt (.1 volt) tone at 1,000 Hz into the microphone jack, (Pin #4 high, Pin #1 ground), and adjust R240 so modulation just reaches +5 KHz peak. The transmitter may be activated by TP101, TP102, or TP103.

2. Set the repeat function modulation input audio level control, R728, located on the transmitter as follows:

   Connect a FM signal generator capable of being set to within .00025% of channel frequency to the receiver antenna port.

   Set the signal generator to the receive channel frequency, modulate the generator with a 1,000 Hz tone, with ±3 KHz peak modulation deviation. Adjust generator attenuator to provide a strong, noise free signal and assure yourself that the signal is properly centered in the receiver, and that the receiver is delivering a clean, 1,000 Hz tone output.

   Then connect an AC VTVM to the arm of R728, and adjust R728 to obtain a reading of .22 volts RMS. It is best to disable the transmitter when making this measurement (by temporarily removing J702 from P709), to avoid false voltmeter indications which might be caused by R.F. pickup in the voltmeter test leads.

Alternate

If an independent signal generator and a modulation meter is available, the following procedure is preferred for obtaining an accurate setting of the repeat function level control, R278.

Connect a FM signal generator, capable of being set to within .00025% of the channel frequency, to the receiver antenna port. Set the signal generator on the receive channel, modulated by a 1,000 Hz tone, with 3 KHz peak modulation deviation. Adjust the generator attenuator to provide a strong, noise free, signal and assure yourself that the signal is properly centered in the receiver band pass, and that the receiver is delivering a clean, 1,000 Hz tone output. Connect a FM modulation meter to obtain signal from the transmitter, and adjust R728 to obtain exactly 3 KHz peak modulation deviation.

8-3 PREPARATION FOR TONE SQUELCH OPERATION

Tone Encoder and Decoder Installations

The repeater has sockets to accommodate up to seven different CTCSS tones. For each tone accommodated, one tone decoder and

one tone encoder is used.(Some repeaters operate without any outgoing tone. For such use, the tone encoder need not be installed.) Normally, the tone encoders and decoders are installed at the factory, and the initial order specifies the tone frequencies to be used. However, if it is desired to add CTCSS tone in the field, or if additional CTCSS tones are to be added in the field, the following instructions apply.

One MA-95 or MA-121 tone encoder should be ordered for each tone frequency required. Tone frequency must be specified on MA-95's.

One MA-90 or MA-166 tone decoder should be ordered for each tone frequency required. Tone frequency must be specified on MA-90's.

NOTE: The MA-90 and MA-116 are the same items as the tone boards used in the MCU series mobiles. They are used as an encoder-decoder in the mobiles, but are used as a decoder only in the repeater. Since these boards have both encoding and decoding sockets of the repeater to function as a decoder, or plugged into the encoding sockets of the repeater to function as an encoder.

TONE SQUELCH OPERATION

In tone squelch operation, the repeater transmitter is activated only by signals bearing the appropriate tone squelch frequency(s).

To prepare the repeater for tone squelch operation, plug JU701 (Yel) to P708. Plug JU702(Wht) to P709. Then proceed with the following instructions for tone encoder and decoder installations.

For the first tone to be installed, install the encoder in P706. If the unit has not already been equipped for tone operation, remove the wire jumper JU704, which is located on the Repeater Control Board, next to P706.

Install subsequent tones as follows:

	Encoder	Decoder
Second Tone	P703	P704
Third Tone	P701	P702
Fourth Tone	P801	P802
Fifth Tone	P803	P804
Sixth Tone	P805	P806
Seventh Tone	P807	P808

When a tone decoder board is installed in each of the connectors P702, P802, etc., the 33,000 ohm "pull-up" resistor just adjacent to that connector should be clipped out of the circuit.

This pull up resistor must remain in the circuit of each unused connector, and must be removed from the circuit on each connector which has a tone decoder installed.

If an operator is stationed at the repeater location, it is normally desired that he will hear transmissions from mobiles on only one of the installed tones. To accomplish this, connect the Tone Select Test Lead to one of the "TONE" test point pins which is physically located between the encode and decode module for that particular tone, i.e., TP701 or TP702, etc. (Monitoring provisions incorporating the grounded microphone hang-up clip permit the operator to monitor all incoming signals when the microphone is removed from its hanger.)

After installation of the tone boards, the encoder output level must be set, as outlined in the level setting procedure. After installing all of the tone encoder boards, rotate the tone level control, R605 on each tone encoder all the way counterclockwise to prepare for level setting procedures.

8-4 AUDIO LEVEL SETTING, TONE SQUELCH ENCODER OPERATION

The first steps in the level setting procedure are to set the transmitter modulation deviation, and the repeat function audio level control R728. The procedures to follow are the same as those outlined in step 1 and 2 of the noise squelch level setting procedure, given in Section 8-2. In the following step one, however, set the peak modulation deviation to 4.5 KHz instead of the 5 KHz given in Section 8-2.

Once these two steps have been completed, you are ready to set the transmit tone levels. Remove the signal generator from the receiver, and connect the tone select test lead to TP703. Then activate the transmitter by pushing the PTT switch on the microphone. Then, set R618, the tone output level control, on the tone encoder in P705 to obtain .5 KHz tone modulation deviation, as indicated by a FM modulation meter. Then proceed to set the tone levels on the remaining tone generators as follows:

Connect Tone Select Test Lead To:	Set R618 Level Control On Tone Encoder Located In Connector:
TP702	P703
TP701	P701
TP801	P801
TP802	P803
TP803	P805
TP804	P807

The next step is to set the tone receive threshold on all of the tone decoders. To do this, inject a signal of the proper channel

frequency into the receiver, and modulate this signal with the wanted CTCSS tone frequency, with a deviation of plus and minus 150 Hz. Then, adjust R612 (on the tone board) until the signal just opens the tone squelch system, and allows the receiver audio to function.

It is assumed that the tone operating frequency of all of the tone units used has already been set to the desired CTCSS channel. If this is not so, consult the frequency adjustment procedures in the manual on the MA-116 and MA-121.

8-5 AUDIO LEVEL SETTING, TONE SQUELCH DECODER OPERATION

When the MA-90 Encoder-Decoder is used, there is no need to make any adjustment of the decoder threshold sensitivity, because this level is fixed within the MA90 circuitry.

When the MA-116 Encoder-Decoder is used it is necessary to set the tone receive threshold adjustment, R612 (on the tone board), in this manner:

With the receiver in the receive condition, and the microphone hang up button grounded to the transceiver chassis, inject a signal of the appropriate channel frequency into the transceiver antenna jack, and modulate this signal with the wanted CTCSS tone frequency, with a deviation of plus and minus 200 Hz. Then, adjust R612 (on the tone board) until the signal just opens the tone squelch system, and allows the receiver audio to function.

After performing this adjustment of R612, check to be sure that the tone squelch will actually open when the tone deviation of the receive signal becomes as much as plus and minus 200 Hz. Further, check to be sure that noise bursts do not come through when the receiver is not receiving any incoming signal.

8-6 SQUELCH CONTROL SETTING

It is important that the squelch control for the noise operated squelch system in the receiver be set properly, regardless of whether noise squelch or tone squelch operation of the repeater is planned. The squelch control, R502, is located toward the front of the receiver's shielded housing, near the loudspeaker. It is located inside the main repeater top housing, so it will not be accessible to the operator.

The typical squelch control setting method, i.e., merely setting the control to the "edge" of the noisy portion may be used. It is more satisfactory, however, to set the squelch control for a known level of signal. This will enable the repeater to operate at proper sensitivity, yet will avoid service calls to reset the squelch because of operator annoyance at squelch openings not caused by wanted signals.

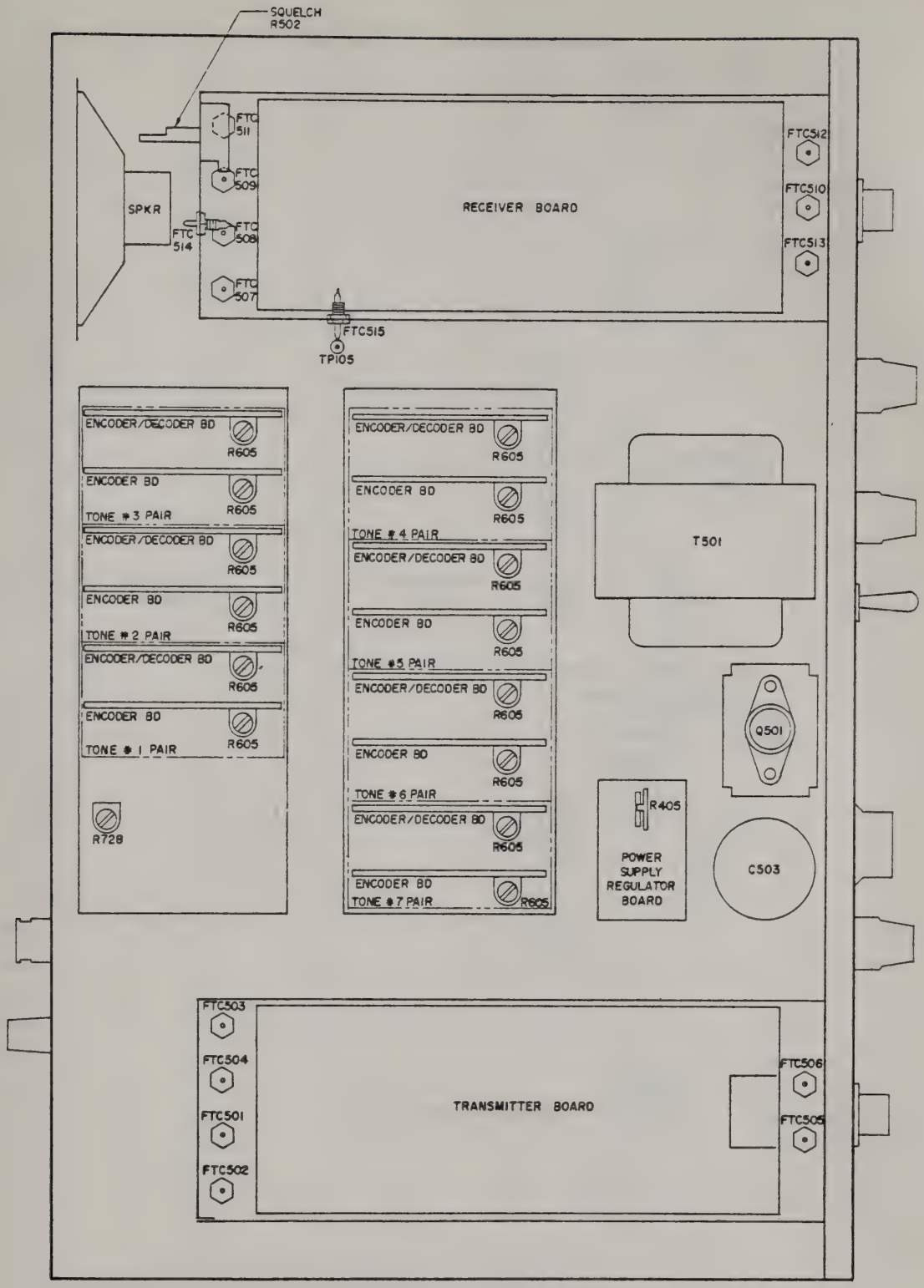
The preferred method is this: Remove the microphone from the hang-up hook, to disable the tone squelch (if used). Inject a signal from a signal generator into the receiver as shown in the Receiver Alignment Chart. Set the signal generator attenuator to provide a .3 microvolt signal to the receiver. Then set the squelch control to the point at which the squelch opens reliably when the signal is connected, and closes when the signal is removed.

8-7 FINAL LISTENING TESTS OF AUDIO LEVEL SETTING

When the repeater has been placed in final operation, it is a good idea to make a listening test to be certain that the Audio Level Setting procedure has been done properly. This is emphasized, because an improperly high level setting can make the repeater sound as if close-in mobiles are at the fringes of coverage, thereby seriously compromising the overall performance of the system.

An ideal way to conduct this listening test is as follows: Have a mobile go to the fringe of reception, and monitor how it sounds on the local loudspeaker in the repeater itself. Have the mobile find a location where you can hear it coming in with a somewhat noisy, but readable signal, and arrange for the mobile to stay fixed at that location. Then, monitor the repeater mobile speech by listening to it in close-in mobile, or at the control station. The apparent noise level should not be different than that observed in the repeater's local loudspeaker.

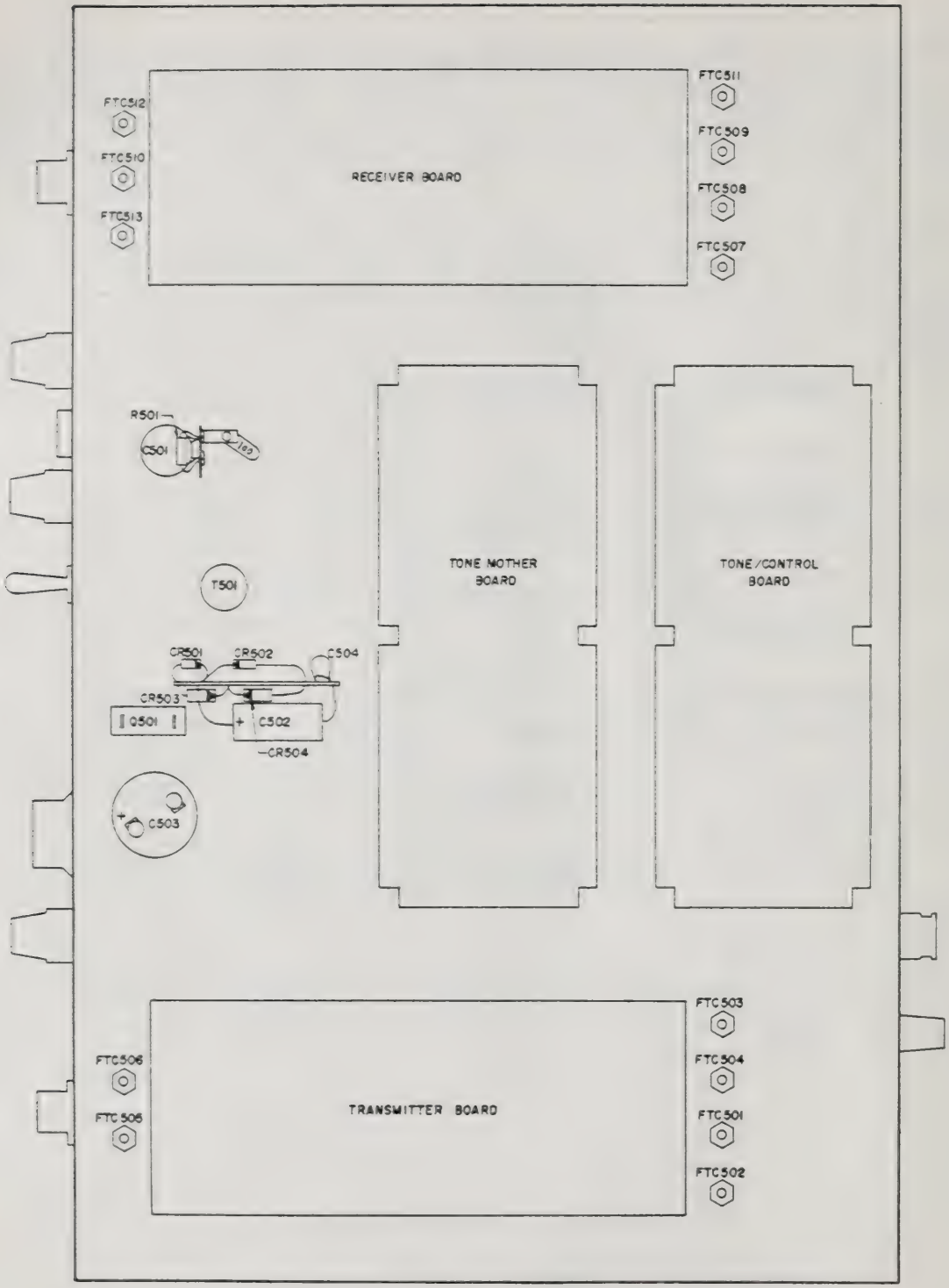
This procedure is suggested as a TEST of the setting of the Audio Level Setting--NOT as an appropriate way of making the setting. Once the listening test assures you that the level is set--mark its setting and be sure that it is not changed unless the proper test equipment and procedures (as outlined earlier) are carried through.



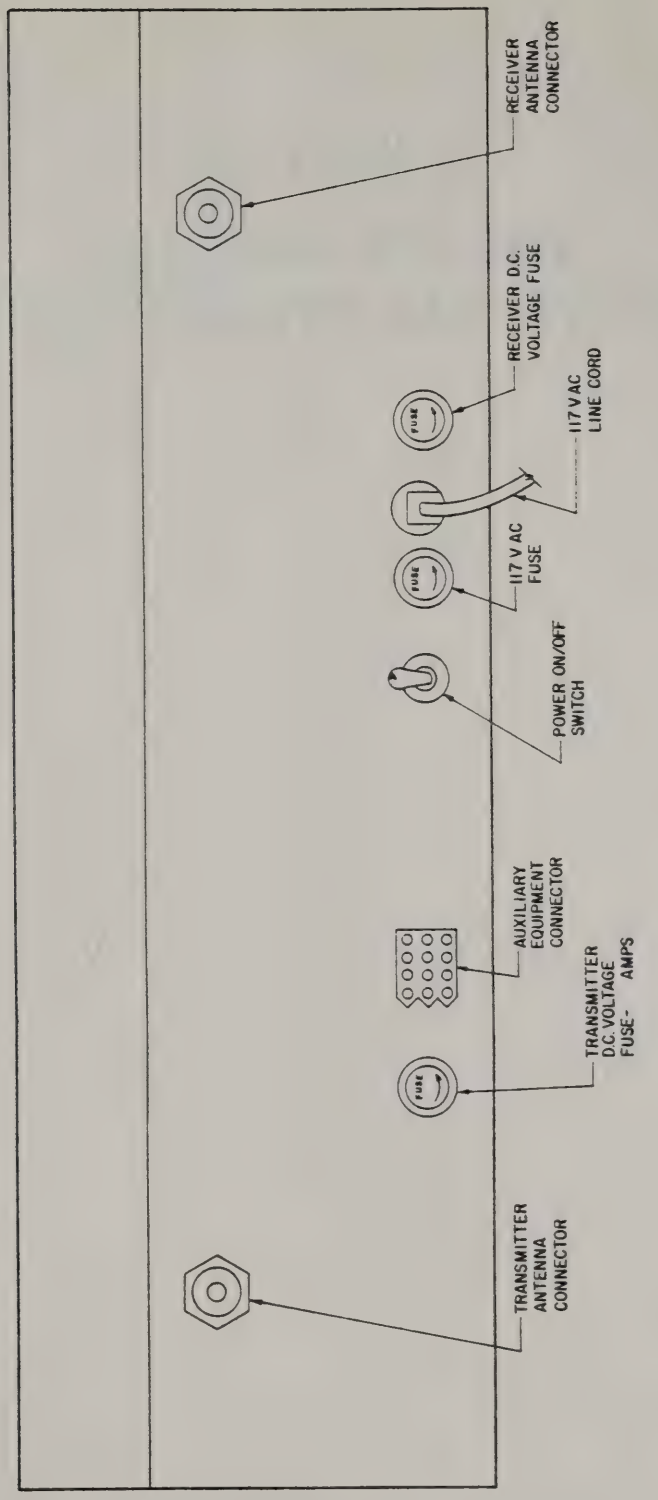
MA-90 & MA-95

8-7 SETUP ADJUSTMENT LOCATIONS

TOP VIEW



8-8 SETUP ADJUSTMENT LOCATIONS
BOTTOM VIEW



8-9 SETUP ADJUSTMENT LOCATIONS
REAR VIEW

SECTION 9

ANTENNA SYSTEM REQUIREMENTS AND TESTS

SECTION 9 ANTENNA SYSTEM REQUIREMENTS AND TESTS

9-1 ISOLATION REQUIREMENTS OF EXTERNAL ANTENNA SYSTEM AND DUPLEXERS

For duplexer and antenna system planning purposes, the following isolation figures must be obtained, either by spacing of separate receive and transmit antennas, by filters, or by an antenna duplexer.

ISOLATION REQUIRED BETWEEN RECEIVER COAXIAL INPUT AND TRANSMITTER COAXIAL OUTPUT:

ISOLATION REQUIRED AT TRANSMIT FREQUENCY: 30 DB

ISOLATION REQUIRED AT RECEIVE FREQUENCY: 56 DB

These figures apply when using the typical 5 MHz spacing between receive and transmit frequencies.

For information on suitable antenna systems and duplexers, refer to the Regency REPEATER APPLICATIONS MANUAL.

9-2 SPECIAL REPEATER TESTS

For proper repeater action to occur, the repeater transmitter must not interfere with the operation of the repeater receiver. It will be noted that the transmitter and the receiver in the repeater are each located in separate, well shielded, compartments. Further, all power and other leads into these compartments are filtered as they enter the compartment. One should not expect proper repeater operation if all of the shields on the transmitter compartment and the receiver compartment are not in place, and well secured.

When installation is first made, the setup should be tested to assure yourself of the following:

1. That the shielding and filtering provisions on the repeater itself are suitably secure so that no interference is heard in the receiver from the transmitter.

2. That the antenna system provides suitable decoupling between the receiver coaxial input and the transmitter input to preclude any interference from the transmitter.

Unsatisfactory repeater performance can usually be traced to

an antenna system that does not satisfy the above condition.

9-3 TEST FOR TRANSMITTER-RECEIVER INTERFERENCE WITHIN THE REPEATER ITSELF

Step 1: Refer to Figure 9-5. Connect a signal generator into the repeater receiver antenna jack, and measure the receiver sensitivity, preferably by the 12 DB SINAD method. While making this measurement, the transmitter should be disabled by removing JU702 from P709. Assure yourself that the receiver is performing to the specification sensitivity.

Step 2: Keeping the signal generator attenuator at the point needed for 12 DB SINAD, as done in Step 1, connect a power meter and a 50 Ohm dummy load to the transmitter antenna coax, as in Figure 9-5. Then key the transmitter on by grounding P709. There should be no change in the sound from the receiver loudspeaker or any observed change in the 12 DB SINAD observed on the SINAD distortion meter. (If there is a change, you may want to know how much--increase the signal generator attenuator until the 12 DB SINAD indication is again achieved. The difference in attenuator DB readings is the amount of degradation.) Again, there should be no observed degradation. If there is, check the shield compartments to see that they are well fastened, and be sure that the power meter and signal generator coax leads are well separated.

9-4 TEST FOR TRANSMITTER-RECEIVER INTERFERENCE IN THE ANTENNA SYSTEMS

Regardless of whether you use two different antennas for receive and transmit functions, or whether you use a duplexer with a single antenna system, you will want to make careful tests to be sure that the antennas, or the duplexer provides sufficient isolation between the repeater transmitter antenna jack and the repeater receiver antenna jack. If enough isolation is not obtained, the transmitter may create serious interference with the receiver--reducing the repeater range, or making the repeater totally inoperative.

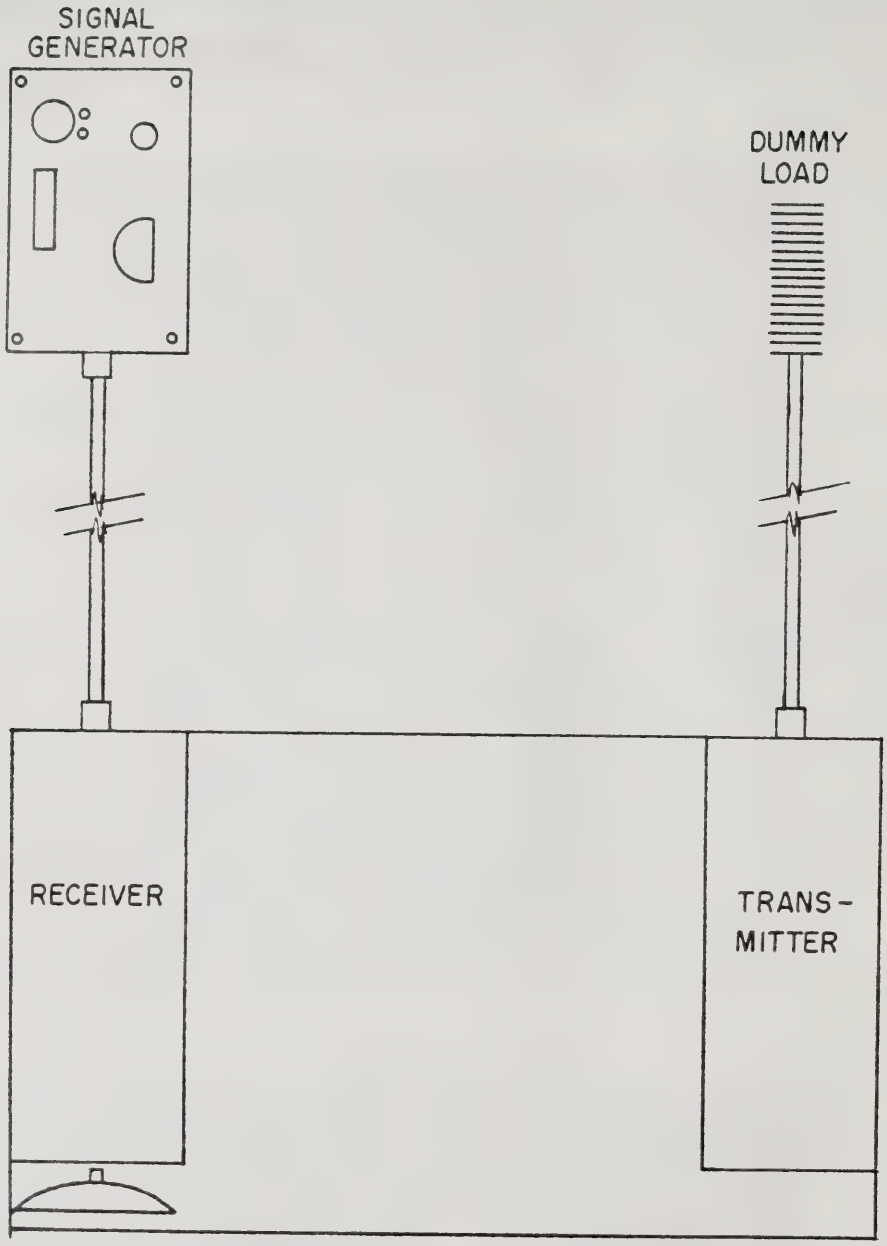
To make this test, first prepare a special fixture, which we will call a "signal injection fixture." Figure 9-6 shows the construction of this fixture. It consists of a coax "T", and a coaxial jumper. Note that center pin from one end of the coaxial

jumper is removed, and this jumper is labeled "SIGNAL GENERATOR." The purpose of this "signal injection fixture" is to permit the receiver antenna to be connected to the receiver input in the normal way, yet still permit a signal to be injected from the signal generator.

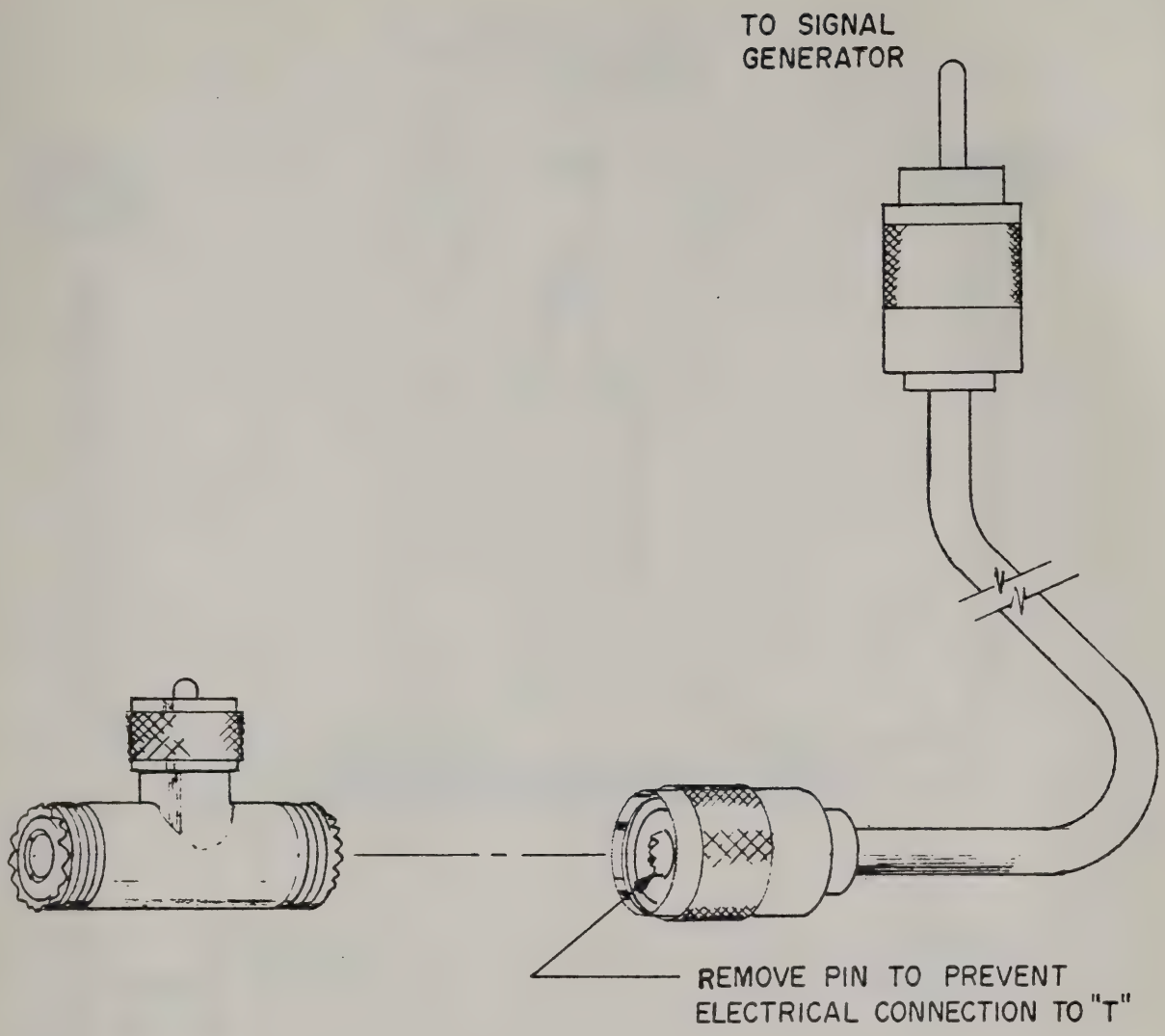
Step 1: When you have the fixture completed, connect it into the receiver antenna jack, with a 50 Ohm coaxial load, and the signal generator as shown in Figure 9-7. Disable the transmitter by removing JU702 from P709 and adjust the signal generator attenuator to obtain a 12 DB SINAD indication on the distortion meter. You will note that the generator output setting must be considerably higher than before. This is because of the attenuation caused by the cut-off pin in the signal injection fixture. Leave the attenuator at this setting. This step calibrates the Signal Injection Fixture for future tests.

Step 2: Remove the 50 Ohm load from the Signal Injection Fixture. Connect the transmit lead of the antenna system to the transmitter output connector. Connect the Receiver lead of the antenna system to the Signal Injection fixture, as shown in Figure 9-8. Leave JU702 disconnected so the transmitter still does not operate. At this point, the 12 DB SINAD indication on the distortion meter should remain unchanged. If there is any degradation, increase the attenuator setting to see how much. (Any change at this step would indicate that the antenna system is reflecting some unusual load on the receiver, and this should be corrected.)

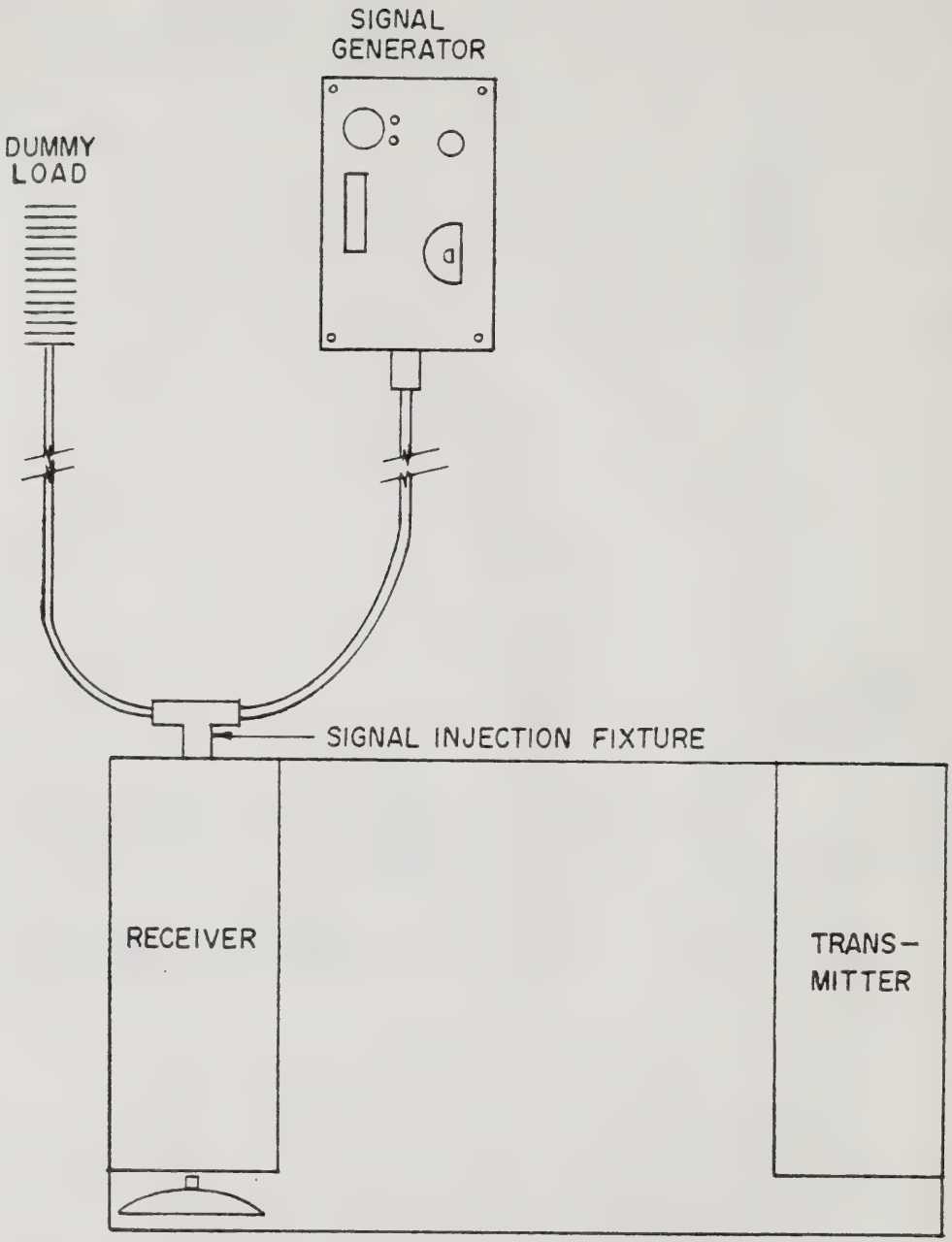
Step 3: With the connections remaining as in Figure 9-8, without changing the generator attenuator setting, key the transmitter on by grounding P709. You should not notice any change in the 12 DB SINAD indication on the distortion meter. If there is any degradation, increase the attenuator setting to see how much. If your antenna system uses a <u>reject</u> type filter tuned to the receive frequency, and you do have some degradation, you may be able to tune it out--make <u>very small</u> adjustments to that filter while watching the distortion meter for a decrease in deflection.



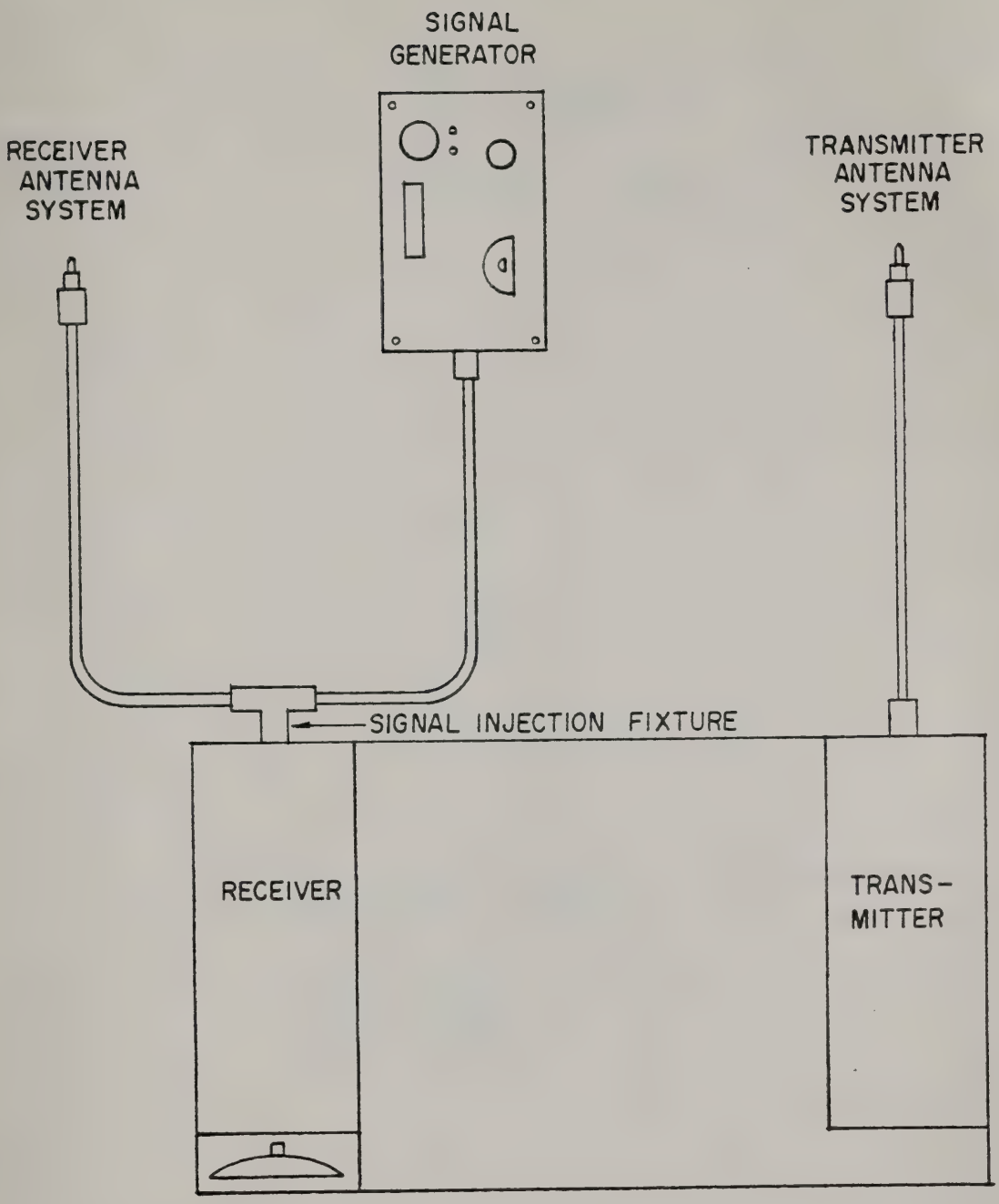
9-5 TEST FOR TRANSMITTER-RECEIVER INTERFERENCE WITHIN THE REPEATER



9-6 SIGNAL INJECTION FIXTURE



9-7 CALIBRATION OF SIGNAL INJECTION FIXTURE



9-8 TEST FOR TRANSMITTER-RECEIVER INTERFERENCE VIA ANTENNA SYSTEM

SECTION 10

PARTS LIST

NOTE: WHEN ORDERING PARTS, PLEASE INCLUDE THE FOLLOWING INFORMATION:

a. MODEL NUMBER (mcu 10r)
b. ITEM NUMBER
c. DESCRIPTION
d. PART NUMBER

10-1 RECEIVER BOARD

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R101A	10K, 10%, ¼W	4701-0103-042
R102A	4.7K, 10%, ¼W	4701-0472-042
R103		
R104		
R105	22K, 10%, ¼W	4701-0223-042
R106	10K, 10%, ¼W	4701-0103-042
R107	220ohm, 10%, ¼W	4701-0221-042
R108		
R109	1K, 10%, ¼W	4701-0102-042
R110	1.5K, 10%, ¼W	4701-0152-042
R111	220ohm, 10%, ¼W	4701-0221-042
R112	10K, 10%, ¼W	4701-0103-042
R113	22K, 10%, ¼W	4701-0223-042
R114	470ohm, 10%, ¼W	4701-0471-042
R115	150ohm, 10%, ¼W	4701-0151-042
R116	10K, 10%, ¼W	4701-0103-042
R117	470ohm, 10%, ¼W	4701-0471-042
R118	330ohm, 10%, ¼W	4701-0331-042
R119	2.2K, 10%, ¼W	4701-0222-042
R120		
R121	2.2K, 10%, ¼W	4701-0222-042
R122	10K, 10%, ¼W	4701-0103-042
R123	10K, 10%, ¼W	4701-0103-042
R124		
R125	47K, 10%, ¼W	4701-0473-042
R126		
R127		
R128	27K, 10%, ¼W	4701-0273-042
R129	1K, 10%, ¼W	4701-0102-042
R130	10K, 10%, ¼W	4701-0103-042
R131	56K, 10%, ¼W	4701-0563-042
R132	10K, Trimmer	4751-0103-001
R133	47K, 10%, ¼W	4701-0473-042
R134	1K, 10%, ¼W	4701-0102-042
R135	1.8K, 10%, ¼W	4701-0182-042
R136	1K, 10%, ¼W	4701-0102-042
R137	47K, 10%, ¼W	4701-0473-042
R138	39K, 10%, ¼W	4701-0393-042
R139	10K, 10%, ¼W	4701-0103-042
R140	4.7K, 10%, ¼W	4701-0472-042
R141	5.6K, 10%, ¼W	4701-0562-042
R142	2.2K, 10%, ¼W	4701-0222-042
R143	47ohm, 10%, ¼W	4701-0470-042
R144	4.7K, 10%, ¼W	4701-0472-042
R145	3.3K, 10%, ¼W	4701-0332-042
R146	2.2K, 10%, ¼W	4701-0222-042
R147	10K, 10%, ¼W	4701-0103-042
R148		
R149	18K, 10%, ¼W	4701-0183-042
R150	5.6K, 10%, ¼W	4701-0562-042
R151	3.3K, 10%, ¼W	4701-0332-042
R152	560ohm, 10%, ¼W	4701-0561-042
R153	47K, 10%, ¼W	4701-0473-042
R154	39ohm, 10%, 1W	4701-0390-045
R155	10K, 10%, ¼W	4701-0103-042
R156	56ohm, 10%, ¼W	4701-0560-042
R157	100ohm, 10%, ¼W	4701-0101-042
R158A	68ohm, 10%, 2W	4710-0680-041
R158B	68ohm, 10%, 2W	4710-0680-041
R159	5.6K, 10%, ¼W	4701-0562-042
R160	470ohm, 10%, ¼W	4701-0471-042
R161	220ohm, 10%, ¼W	4701-0221-044
R162		
R164	220ohm, 10%, ¼W	4701-0221-044
R165	470ohm, 10%, ¼W	4701-0471-042

ITEM	DESCRIPTION	PART NO.
	CAPACITORS	
C101A	33PF, 10%, NPO, 50V(DISC)	1500-0330-650
C102		
C103	360PF, 5%, 50V(MICA)	1506-0361-550
C104	25PF, 10%, NPO, 50V(DISC)	1500-0240-650
C105	39PF, 10%, NPO, 50V(DISC)	1500-0390-650
C106	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C107	15PF, 10%, NPO, 50V(DISC)	1500-0150-650
C108	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C109	68PF, 5%, NPO, 50V(DISC)	1524-0680-002
C110	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C111	47PF, 5%, NPO, 50V(DISC)	1524-0470-002
C112	20PF, 10%, NPO, 50V(DISC)	1500-0200-650
C113	20PF, 10%, NPO, 50V(DISC)	1500-0200-650
C114	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C115	100PF, 5%, 50V(MICA)	1507-0101-001
C116	47PF, 5%, NPO, 50V(DISC)	1524-0470-002
C117	82PF, 5%, NPO, 50V(DISC)	1524-0820-002
C118	47PF, 5%, NPO, 50V(DISC)	1524-0470-002
C119	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C120	47PF, 5%, NPO, 50V(DISC)	1524-0470-002
C121	470 PF, 20%, 50V(DISC)	1523-0471-002
C122	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C123		
C124	5.6PF, 10%, NPO, 500V(DISC)	1500-0569-905
C125	5.6PF, 10%, NPO, 500V(DISC)	1500-0569-905
C126	47PF, 5%, NPO, 50V(DISC)	1524-0470-002
C127	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C128	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C129	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C130	220PF, 5%, 50V(MICA)	1506-0221-550
C131	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C132	3.9PF, 10%, NPO, 500V(DISC)	1500-0399-905
C133	300PF, 5%, 50V(MICA)	1506-0301-550
C134	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C135	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C136	68PF, 5%, NPO, 50V(DISC)	1524-0680-002
C137	.2 mfd, +80-20%, 12V(DISC)	1502-0204-006
C138		
C139	68PF, 5%, 50V(MICA)	1506-0680-550
C140	82PF, 5%, NPO, 50V(DISC)	1524-0820-002
C141	200PF, 5%, 50V(MICA)	1506-0201-550
C142	680PF, 5%, 50V(MICA)	1506-0681-550
C143	.2 mfd, +80-20%, 12V(DISC)	1502-0204-006
C144	.2 mfd, +80-2-%, 12V(DISC)	1502-0204-006
C145	.2 mfd. +80-20%, 12V(DISC)	1502-0204-006
C146	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C147	39PF, 10%, NPO, 50V(DISC)	1500-0390-650
C148	.2 mfd, +80-20%, 12V(DISC)	1502-0204-006
C149	68PF, 5%, NPO, 50V(DISC)	1524-0680-002
C150	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C151	1 mfd, 50V, 85°C (Electrolytic)	1513-0010-004
C152	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C153		
C154	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C155	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C156	.002 mfd, 20%, 50V(DISC)	1523-0202-002
C157	.1 mfd, 20%, 12V(DISC)	1502-0104-005
C158	.047 mfd, 10%, 100V(Mylar Film)	1508-0473-610
C159	25 mfd, 10V, 85°C (Electrolytic)	1513-0250-001
C160		
C161	.047 mfd, 10%, 100V(Mylar Film)	1508-0473-610
C162	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C163	250 mfd, 16V, 85°C (Electrolytic)	1513-0251-002
C164		
C165	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C166		
C167	100 mfd, 16V, 85°C (Electrolytic)	1513-0101-002
C168	100 mfd, 16V, 85°C (Electrolytic)	1513-0101-002
C169	100 mfd, 16V, 85°C (Electrolytic)	1513-0101-002
C170	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C171	470PF, 20%, 50V(DISC)	1523-0471-002
C172	100 mfd, 16V, 85°C (Electrolytic)	1513-0101-002
C173	.1 mfd, +80-20%, 12V(DISC)	1502-0104-005
C174	250 mfd, 16V, 85°C (Electrolytic)	1513-0251-002
C175	.0047 mfd, 10%, 100V(Mylar Film)	1508-0472-610
C176	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006

10-1 RECEIVER BOARD

ITEM	DESCRIPTION	PART NO.
	DIODES	
CR101A	Varicap,MV2209	4809-0000-001
CR102		
CR103	Sil,102-412,1N4148	4805-1241-200
CR104	Zener,8.2V	4808-0000-009
CR105	Zener,6v,5%,MZ92-6.0B	4808-0000-012
	TRANSISTORS	
Q101	NPN	4801-0000-095
Q102	NPN	4801-0000-095
Q103	NPN	4801-0000-095
Q104	NPN	4801-0000-095
Q105	FET	4811-0000-005
Q106	FET	4811-0000-030
Q107	PNP(Wht Top)	4801-0000-060
Q108	NPN	4801-0000-010
Q109	NPN	4801-0000-010
Q110	NPN	4801-0000-010
Q111	PNP(Wht Top)	4801-0000-060
Q112	NPN	4801-0000-010
Q113	NPN	4801-0000-010
Q114	NPN	4801-0000-005
Q115	NPN	4802-0000-002
	COILS	
L101A	Frequency Adjust	1800-3191-406
L102		
L103		
L104	Oscillator Adjust	1800-5100-521
L105	Choke,RF,.27 uhy	1802-0278-008
L106	Choke,RF,15 uhy	1802-0150-004
L107	Buffer Adjust	1800-5100-511
L108	Choke,RF	1800-5100-523
L109	Antenna Tune	1800-5129-101
L110	Antenna Tune	1800-5129-102
L111	Choke,RF	1800-5100-522
L112	RF Tune	1800-5129-103
L113	RF Tune	1800-5129-102
L114	Mixer Injection Tuning	1800-5129-104
L115	Mixer Injection Tuning	1800-5129-102
L116	Choke,RF	1800-5100-523
L117	Choke,RF,.1 uhy	1802-0108-008
L118	Choke,RF,22 uhy	1802-0220-008
L119	Crystal Filter Tune	1800-3248-001
L120	Crystal Filter Tune	1800-3248-001
L121	Choke,RF,820 uhy	1802-0000-002
L122	Choke,RF,820 uhy(Shielded)	1803-3182-700
L123	Discriminator Adjust	1800-3218-800
L124	Choke,RF,100 uhy	1802-0101-008
L125	Choke,RF,15 uhy	1802-0150-004
L126	Bead,Choke	2502-0000-001
L127	Bead,Choke	2502-0000-001
L128	Bead,Choke	2502-0000-001
L129	Bead,Choke	2502-0000-001
L130	Bead,Choke	2502-0000-001
L131	Bead,Choke	2502-0000-001
L132	Choke,RF,100 uhy	1802-0101-008
T101	Coil,HR2A	1800-3168-300
	THERMISTORS	
RT101	Thermistor	5300-0000-001
	INTEGRATED CIRCUITS	
IC101	10.7 MHz Amp	3130-3167-901
IC102	Amp-Mixer	3130-3167-901
IC103	Limiter-Discriminator	3130-3157-603
IC104	Audio Amp	3130-3248-801

ITEM	DESCRIPTION	PART NO.
	CRYSTALS	
Y101	Crystal,Receive(Specify Freq.)	2329-0000-000
Y102	10.245 MHz(Standard)	2301-3151-601
	FILTERS	
FL101	Filter,Xtal 2P 10.7 MHz	2705-3232-200
FL102	Filter,Xtal 2P 10.7 MHz	2705-1306-600
FL103	Filter,Xtal 2P 10.7 MHz	2705-3232-200
FL104	Filter,Ceramic	2700-3209-500

10-2 TRANSMITTER BOARD

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R201	47K, 10%, ¼W	4701-0473-042
R202	22K, 10%, ¼W	4701-0223-042
R203A	47K, 10%, ¼W	4701-0473-042
R204	4.7K, 10%, ¼W	4701-0472-042
R205A	10K, 10%, ¼W	4701-0103-042
R206	100ohm, 10%, ¼W	4701-0101-042
R208	22K, 10%, ¼W	4701-0223-042
R209	6.8K, 10%, ¼W	4701-0682-042
R210	10K, 10%, ¼W	4701-0103-042
R211	220ohm, 10%, ¼W	4701-0221-042
R212	10K, 10%, ¼W	4701-0103-042
R213	10K, 10%, ¼W	4701-0103-042
R214	680ohm, 10%, ¼W	4701-0681-042
R215	470ohm, 10%, ¼W	4701-0471-042
R216	10K, 10%, ¼W	4701-0103-042
R217	33ohm, 10%, ¼W	4701-0330-044
R218	10K, 10%, ¼W	4701-0103-042
R219	470ohm, 10%, ¼W	4701-0471-042
R220	10K, 10%, ¼W	4701-0103-042
R221	330ohm, 10%, ¼W	4701-0331-042
R222	470ohm, 10%, ¼W	4701-0471-042
R223	10K, 10%, ¼W	4701-0103-042
R224	220ohm, 10%, ¼W	4701-0221-042
R225	2.2K, 10%, ¼W	4701-0222-042
R226	10K, 10%, ¼W	4701-0103-042
R227	1K, Trimmer	4751-0102-005
R228	100ohm, 10%, ¼W	4701-0101-042
R229	10K, 10%, ¼W	4701-0103-042
R230	4.7K, 10%, ¼W	4701-0472-042
R231	100K, 10%, ¼W	4701-0104-042
R232	4.7K, 10%, ¼W	4701-0472-042
R233	100K, 10%, ¼W	4701-0104-042
R234	1.5meg, 10%, ¼W	4701-0155-042
R235	4.7K, 10%, ¼W	4701-0472-042
R236	120K, 10%, ¼W	4701-0124-042
R237	12K, 10%, ¼W	4701-0123-042
R238	470K, 10%, ¼W	4701-0474-042
R239	12K, 10%, ¼W	4701-0123-042
R240	10K, Trimmer	4751-0103-001
R241	470ohm, 10%, ¼W	4701-0471-042
R242A	68ohm, 10%, 2W	4710-0680-041
R242B	68ohm, 10%, 2W	4710-0680-041
R244	220ohm, 10%, ¼W	4701-0221-044
R245	220ohm, 10%, ¼W	4701-0221-044
	CAPACITORS	
C203	360PF, 5%, 50V(MICA)	1506-0361-550
C204	20PF, 10%, NPO, 50V(DISC)	1500-0200-650
C205	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C206	360PF, 5%, 50V(MICA)	1506-0361-550
C207	100PF, 5%, 50V(MICA)	1507-0101-001
C208	5PF, 10%, NPO, 500V(DISC)	1500-0050-905
C209	47PF, 5%, NPO, 50V(DISC)	1524-0470-002
C210	150PF, 5%, 50V(MICA)	1506-0151-550
C211	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C212	47PF, 5%, NPO, 50V(DISC)	1524-0470-002
C214	120PF, 5%, 50V(MICA)	1506-0121-550
C215	2.2PF, ±.25PF, NPO(DISC)	1500-0229-205
C216	47PF, 5%, NPO, 50V(DISC)	1524-0470-002
C217	150PF, 5%, 50V(MICA)	1506-0151-550
C218	.01 mfd, +80-20%, 25V(DISC)	1502-0103-004
C219	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C220	8.2PF, 10%, NPO, 500V(DISC)	1500-0829-905
C221	2.2PF, ±.25PF, NPO(DISC)	1500-0229-205
C222	8.2PF, 10%, NPO, 500V(DISC)	1500-0829-905
C223	1PF, 10%(Composition)	1510-0010-900
C224	12PF, 10%, NPO, 500V(DISC)	1500-0120-605
C225	47PF, 5%, NPO(DISC)	1524-0470-002
C226	.01 mfd, +80-20%, 25V(DISC)	1502-0103-004
C227	15PF, 10%, NPO, 50V(DISC)	1500-0150-650
C228	6.8PF, 10%, NPO, 500V(DISC)	1500-0689-905
C229	0.22PF, 10%(Composition)	1510-0228-900
C230	6.8PF, 10%, NPO, 500V(DISC)	1500-0689-905
C231	2.5-20PF, Trimmer	1517-0000-019

ITEM	DESCRIPTION	PART NO.
C232	82PF, 5%, NPO, 50V(DISC)	1501-0820-008
C233	2-6PF, Trimmer	1517-0000-018
C234	0.68PF, 10%(Composition)	1510-0688-900
C235	2-6PF, Trimmer	1517-0000-018
C236	0.68PF, 10%(Composition)	1510-0688-900
C237	2-6PF, Trimmer	1517-0000-018
C238	5PF, 10%, NPO, 500V(DISC)	1500-0050-905
C239	2PF, NPO	1501-0020-001
C240	470PF, 20%, 50V(DISC)	1523-0471-002
C241	10 mfd, 25V, 85°C (Electrolytic)	1513-0100-003
C242	10 mfd, 25V, 85°C (Electrolytic)	1513-0100-003
C243	470PF, 20%, 50V(DISC)	1523-0471-002
C244	470PF, 20%, 50V(DISC)	1523-0471-002
C245	10 mfd, 25V, 85°C (Electrolytic)	1513-0100-003
C246	.01 mfd, +80-20%, 25V(DISC)	1502-0103-004
C247	2.2PF, ±.25PF, NPO(DISC)	1500-0229-205
C248	2.2PF, ±.25PF, NPO(DISC)	1500-0229-205
C249	15PF, 10%, NPO, 50V(DISC)	1500-0150-650
C251	15PF, 10%, NPO, 50V(DISC)	1500-0150-650
C252	1000 mfd, 16V, 85°C (Electrolytic)	1513-0102-002
C253	.01 mfd, +80-20%, 25V(DISC)	1502-0103-004
C254	10 mfd, 25V, 85°C (Electrolytic)	1513-0100-003
C255	100 mfd, 16V, 85°C (Electrolytic)	1513-0101-002
C256	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C257	10 mfd, 25V, 85°C (Electrolytic)	1513-0100-003
C258	.001 mfd, 20%, 50V(DISC)	1523-0102-002
C259	10PF, 10%, NPO, 500V(DISC)	1500-0100-605
C260	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C261	1 mfd, 50V, 85°C (Electrolytic)	1513-0010-004
C262	.0033 mfd, 10%, 100V(Mylar Film)	1508-0332-610
C263	.033 mfd, 10%, 100V(Mylar Film)	1508-0333-610
C264	150PF, 20%, 50V(DISC)	1523-0151-002
C265	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
C266	.1 mfd, +80-20%, 12V(DISC)	1502-0104-005
C267	.1 mfd, +80-20%, 12V(DISC)	1502-0104-005
C268	10PF, 10%, NPO, 500V(DISC)	1500-0100-605
C269	.01mfd, +80-20%, 25V(DISC)	1502-0103-004
C270	3.9PF, +.25PF, NPO(DISC)	1500-0399-205
C271	.01 mfd, +80-20%, 12V(DISC)	1502-0103-006
	DIODES	
CR201A	Varicap, MV2209	4809-0000-001
CR203	Sil Rect, 1N4002	4806-0000-004
CR204	Sil Rect, 1N4002	4806-0000-004
CR205	Sil Rect, 1N4002	4806-0000-004
CR206	Sil Rect, 1N4002	4806-0000-004
CR207	Zener, 6V, 5% MZ92-6.0B	4808-0000-012
CR208	Zener, 8.2V, 1N4738A	4808-0000-009
CR209	Sil, 1N4148, 102-412	4805-1241-200
CR210	Sil, 1N4148, 102-412	4805-1241-200
CR211	Sil, 1N4148, 102-412	4805-1241-200
CR212	Zener, 6V, 5% MZ92-6.0B	4808-0000-012
	TRANSISTORS	
Q201	Silicon, NPN(Blu Top)	4801-0000-003
Q202	Silicon, NPN(Red Top)	4801-0000-035
Q203	NPN, RF Power	4804-3169-605
Q204	NPN, RF Power	4804-3169-605
Q205	NPN, RF Power	4804-3169-607
Q206	NPN	4802-0000-002
Q207	NPN	4801-0000-005
Q208	NPN	4802-0000-002
	THERMISTORS	
RT201	Thermistor	5300-0000-004
RT202	Thermistor	5300-0000-001
	INTEGRATED CIRCUITS	
IC201	Speech Amp	3130-3167-909

10-2 TRANSMITTER BOARD

ITEM	DESCRIPTION	PART NO.
	COILS	
L201A	Frequency Adjust	1800-3247-201
L204	Oscillator,Output	1800-3191-404
L205	Buffer,input	1800-3191-405
L206	Choke,RF,5.6 uhy	1802-0569-008
L207	Buffer,input	1800-3191-405
L208	Buffer,input	1800-3191-405
L209	Choke,RF,.68 uhy	1802-0688-003
L210	Tripler,output	1800-5100-524
L211	Tripler,output	1800-5100-520
L212	Tripler,input	1800-5100-520
L213	Choke,RF,.47 uhy	1802-0478-008
L214	Doubler,output	1800-5100-511
L215	Doubler,output	1800-5100-511
L216		
L217	RF,inductor	1802-5125-904
L218	RF,inductor	1801-3247-401
L219	RF,inductor	1801-3247-401
L220	RF,inductor	1801-3247-401
L221	RF,Bead Assy.	2502-3254-101
L222	RF,Bead Assy.	2502-3254-101
L223	RF,Bead Assy.	2502-3254-101
L224	RF,Inductor	1801-3247-401
L225	RF,Inductor	1801-3247-401
L226	RF,Bead Assy.	2502-3254-101
L227	RF,Bead Assy.	2502-3254-101
	ELECTRICAL COMPONENTS	
K201	Relay	4500-0000-006

ITEM	DESCRIPTION	PART NO.

10-3 LED DISPLAY BOARD 302-485

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R401	470ohm, 10%, ¼W	4701-0471-042
R402	330ohm, 10%, ¼W	4701-0331-044
	DIODES	
LD401	Diode LED RED	4810-1282-900
LD402	Diode LED GRN	4810-1299-300

10-4 REGULATOR BOARD 302-032

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R401	1K, 10%, ½W	4701-0102-042
R402	1.5K, 10%, ½W	4701-0152-042
R403	10ohm, 10%, ½W	4701-0100-042
R404	470ohm, 5%, ½W	4701-0471-032
R405	100ohm, Trimmer	4751-0101-005
R406	470ohm, 5%, ½W	4701-0471-032
	CAPACITORS	
C401	.05 mfd, +80-20%, 25v(DISC)	1502-0503-004
	DIODES	
CR401	Zener, 6v, ±5%, 500MW	4801-0000-140
	TRANSISTORS	
Q401	NPN	4801-0000-005
Q402	NPN	4801-0000-010

ITEM	DESCRIPTION	PART NO.

10-5 TONE/CONTROL BOARD 504-005

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R701	22K,10%,¼W	4701-0223-042
R702	22K,10%,¼W	4701-0223-042
R703	22K,10%,¼W	4701-0223-042
R704	10K,10%,¼W	4701-0103-042
R705	470ohm,10%,¼W	4701-0471-042
R706	10K,10%,¼W	4701-0103-042
R707	4.7K,10%,¼W	4701-0472-042
R708	22K,10%,¼W	4701-0223-042
R709	22K,10%,¼W	4701-0223-042
R710	22K,10%,¼W	4701-0223-042
R711	10K,10%,¼W	4701-0103-042
R712	470ohm,10%,¼W	4701-0471-042
R713	10K,10%,¼W	4701-0103-042
R714	4.7K,10%,¼W	4701-0472-042
R715	22K,10%,¼W	4701-0223-042
R716	22K,10%,¼W	4701-0223-042
R717	22K,10%,¼W	4701-0223-042
R718	10K,10%,¼W	4701-0103-042
R719	470ohm,10%,¼W	4701-0471-042
R720	10K,10%,¼W	4701-0103-042
R721	4.7K,10%,¼W	4701-0472-042
R722	4.7K,10%,¼W	4701-0472-042
R723	4.7K,10%,¼W	4701-0472-042
R724	4.7K,10%,¼W	4701-0472-042
R725	22K,10%,¼W	4701-0223-042
R726	4.7K,10%,¼W	4701-0472-042
R727	10K,10%,¼W	4701-0103-042
R728	10K,Trimmer	4751-0103-001
R729	1K,10%,¼W	4701-0102-042
R730	1K,10%,¼W	4701-0102-042
R731	10K,10%,¼W	4701-0103-042
R732	10K,10%,¼W	4701-0103-042
R733	4.7K,10%,¼W	4701-0472-042
R734	220ohm,10%,¼W	4701-0221-042
R735	3.3meg,10%,¼W	4701-0335-042
R736	220ohm,10%,¼W	4701-0221-042
R737	10K,10%,¼W	4701-0103-042
R738	1.5meg,10%,¼W	4701-0155-042
R739	22K,10%,¼W	4701-0223-042
R740	1K,10%,¼W	4701-0102-042
R741	220ohm,10%,¼W	4701-0221-042
R742	33K,10%,¼W	4701-0333-042
R743	33K,10%,¼W	4701-0333-042
R744	33K,10%,¼W	4701-0333-042
R745	1.5meg,10%,¼W	4701-0155-042
R746	220K,5%,¼W	4701-0224-042
R747	100ohm,10%,¼W	4701-0101-042
R748	2.2K,10%,¼W	4701-0222-042
R749	10K,10%,¼W	4701-0103-042
R751	100K,10%,¼W	4701-0104-042
R753	10K,10%,¼W	4701-0103-042
R754	10K,10%,¼W	4701-0103-042
R755	10K,10%,¼W	4701-0103-042
R756	10K,10%,¼W	4701-0103-042
R757	100K,10%,¼W	4701-0104-042
R758	10K,10%,¼W	4701-0103-042
R759	10K,10%,¼W	4701-0103-042
R760	10K,10%,¼W	4701-0103-042
R761	180ohm,10%,¼W	4701-0181-042
R762	33K,10%,¼W	4701-0333-042
R763	33K,10%,¼W	4701-0333-042
R764	33K,10%,¼W	4701-0333-042
	CAPACITORS	
C701	.068 mfd,10%,100v(Mylar Film)	1508-0687-610
C702	.068 mfd,10%,100v(Mylar Film)	1508-0687-610
C703	.068 mfd,10%,100v(Mylar Film)	1508-0687-610
C704	25 mfd,10v,85°C (Electrolytic)	1513-0250-001
C705	25 mfd,10v,85°C (Electrolytic)	1513-0250-001
C706	.0033 mfd,10%,100V(Mylar Film)	1508-0332-610
C708	1000 mfd,16v,85°C (Electrolytic)	1513-0102-002
C709	.002 mfd,20%,50v(DISC)	1523-0202-002
C710	.002 mfd,20%,50v(DISC)	1523-0202-002
C711	.002 mfd,20%,50v(DISC)	1523-0202-002
C712	.002 mfd,20%,50v(DISC)	1523-0202-002
C713	.01 mfd,+80-20%,12v(DISC)	1502-0103-006
C714	100 mfd,16v,85°C (Electrolytic)	1513-0101-002
C715	250 mfd,16v,85°C (Electrolytic)	1513-0251-002
C716	.047 mfd,10%,100v(Mylar Film)	1508-0473-610
C717	.047 mfd,10%,100V(Mylar Film)	1508-0473-610

ITEM	DESCRIPTION	PART NO.
	DIODES	
CR701	Sil,1N4148,102-412	4805-1241-200
CR702	Sil,1N4148,102-412	4805-1241-200
CR703	Sil,1N4148,102-412	4805-1241-200
CR704	Sil,1N4148,102-412	4805-1241-200
CR705	Sil,1N4148,102-412	4805-1241-200
CR706	Sil,1N4148,102-412	4805-1241-200
CR707	Sil,1N4148,102-412	4805-1241-200
CR708	Sil,1N4148,102-412	4805-1241-200
CR709	Sil,1N4148,102-412	4805-1241-200
CR710	Sil,1N4148,102-412	4805-1241-200
CR711	Sil,1N4148,102-412	4805-1241-200
CR712	Sil,1N4148,102-412	4805-1241-200
CR713	Sil,1N4148,102-412	4805-1241-200
CR714	Sil,1N4148,102-412	4805-1241-200
CR715	Sil,1N4148,102-412	4805-1241-200
CR716	Sil,1N4148,102-412	4805-1241-200
CR717	Sil,1N4148,102-412	4805-1241-200
CR718	Sil,1N4148,102-412	4805-1241-200
CR719	Sil,1N4148,102-412	4805-1241-200
CR720	Germ, 102-339	4807-1233-900
CR721	Sil,102-412	4805-1241-200
LD701	Diode LED RED	4810-1282-900
LD702	Diode LED RED	4810-1282-900
LD703	Diode LED RED	4810-1282-900
	TRANSISTORS	
Q701	NPN	4801-0000-010
Q702	NPN	4801-0000-010
Q703	NPN	4801-0000-010
Q704	NPN	4801-0000-010
Q705	NPN	4801-0000-010
Q706	NPN	4801-0000-010
Q707	NPN	4801-0000-010
Q708	PNP(Wht Top)	4801-0000-060
Q709	PNP(Wht Top)	4801-0000-060
Q710	NPN	4801-0000-010
Q711	NPN	4801-0000-010
Q712	PNP(Wht Top)	4801-0000-060
Q713	NPN	4801-0000-010
Q714	NPN	4801-0000-010
Q715	NPN	4801-0000-010
Q716	NPN	4801-0000-010
Q717	NPN	4801-0000-010
Q718	NPN	4801-0000-010

10-6 TONE AUXILIARY BOARD 504-009

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R801	22K, 10%, ¼W	4701-0223-042
R802	22K, 10%, ¼W	4701-0223-042
R803	22K, 10%, ¼W	4701-0223-042
R804	10K, 10%, ¼W	4701-0103-042
R805	470ohm, 10%, ¼W	4701-0471-042
R806	10K, 10%, ¼W	4701-0103-042
R807	4.7K, 10%, ¼W	4701-0472-042
R808	22K, 10%, ¼W	4701-0223-042
R809	22K, 10%, ¼W	4701-0223-042
R810	22K, 10%, ¼W	4701-0223-042
R811	10K, 10%, ¼W	4701-0103-042
R812	470ohm, 10%, ¼W	4701-0471-042
R813	10K, 10%, ¼W	4701-0103-042
R814	4.7K, 10%, ¼W	4701-0472-042
R815	22K, 10%, ¼W	4701-0223-042
R816	22K, 10%, ¼W	4701-0223-042
R817	22K, 10%, ¼W	4701-0223-042
R818	10K, 10%, ¼W	4701-0103-042
R819	470ohm, 10%, ¼W	4701-0471-042
R820	10K, 10%, ¼W	4701-0103-042
R821	4.7K, 10%, ¼W	4701-0472-042
R822	22K, 10%, ¼W	4701-0223-042
R823	22K, 10%, ¼W	4701-0223-042
R824	22K, 10%, ¼W	4701-0223-042
R825	10K, 10%, ¼W	4701-0103-042
R826	470ohm, 10%, ¼W	4701-0471-042
R827	10K, 10%, ¼W	4701-0103-042
R828	4.7K, 10%, ¼W	4701-0472-042
R829	4.7K, 10%, ¼W	4701-0472-042
R830	4.7K, 10%, ¼W	4701-0472-042
R831	4.7K, 10%, ¼W	4701-0472-042
R832	33K, 10%, ¼W	4701-0333-042
R833	33K, 10%, ¼W	4701-0333-042
R834	33K, 10%, ¼W	4701-0333-042
R835	33K, 10%, ¼W	4701-0333-042
	CAPACITORS	
C801	.068 mfd, 10%, 100v (Mylar Film)	1508-0687-610
C802	.068 mfd, 10%, 100v (Mylar Film)	1508-0687-610
C803	.068 mfd, 10%, 100v (Mylar Film)	1508-0687-610
C804	.068 mfd, 10%, 100v (Mylar Film)	1508-0687-610
C805	25 mfd, 10v, 85°C (Electrolytic)	1513-0250-001
C806	25 mfd, 10v, 85°C (Electrolytic)	1513-0250-001
	DIODES	
CR801	Sil, 1N4148, 102-412	4805-1241-200
CR802	Sil, 1N4148, 102-412	4805-1241-200
CR803	Sil, 1N4148, 102-412	4805-1241-200
CR804	Sil, 1N4148, 102-412	4805-1241-200
CR805	Sil, 1N4148, 102-412	4805-1241-200
CR806	Sil, 1N4148, 102-412	4805-1241-200
CR807	Sil, 1N4148, 102-412	4805-1241-200
CR808	Sil, 1N4148, 102-412	4805-1241-200
CR809	Sil, 1N4148, 102-412	4805-1241-200
CR810	Sil, 1N4148, 102-412	4805-1241-200
CR811	Sil, 1N4148, 102-412	4805-1241-200
CR812	Sil, 1N4148, 102-412	4805-1241-200
CR813	Sil, 1N4148, 102-412	4805-1241-200
CR814	Sil, 1N4148, 102-412	4805-1241-200
CR815	Sil, 1N4148, 102-412	4805-1241-200
CR816	Sil, 1N4148, 102-412	4805-1241-200
LD801	Diode LED RED	4810-1282-900
LD802	Diode LED RED	4810-1282-900
LD803	Diode LED RED	4810-1282-900
LD804	Diode LED RED	4810-1282-900

ITEM	DESCRIPTION	PART NO.
	TRANSISTORS	
Q801	NPN	4801-0000-010
Q802	NPN	4801-0000-010
Q803	NPN	4801-0000-010
Q804	NPN	4801-0000-010
Q805	NPN	4801-0000-010
Q806	NPN	4801-0000-010
Q807	NPN	4801-0000-010
Q808	NPN	4801-0000-010

10-7 TONE ENCODER-DECODER BD. 302-508

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R601	130K, 10%, ¼W	4701-0134-032
R602	91K, 10%, ¼W	4701-0913-032
R604	15K, 10%, ¼W	4701-0153-042
R605	10K, Trimmer	4751-0103-002
R607	100K, 10%, ¼W	4701-0104-042
	CAPACITORS	
C601	.01 mfd, +80-20%, 12v(DISC)	1502-0103-006
C602	.01 mfd, +80-20%, 12v(DISC)	1502-0103-006
C603	15 mfd, ±20%, 10v(TANT)	1515-0150-002
C604	.2 mfd, +80-20%, 12v(DISC)	1502-0204-006
C605	.01 mfd, +80-20%, 12v(DISC)	1502-0103-006
C606	25 mfd, 10v, 85°C (Electrolytic)	1513-0250-001
C607	15 mfd, ±20%, 10v(TANT)	1515-0150-002
C608	.01 mfd, +80-20%, 12v(DISC)	1502-0103-006
C609	.1 mfd, +80-20%, 12v(DISC)	1502-0104-005
C610	.01 mfd, +80-20%, 12v(DISC)	1502-0103-006
	INTEGRATED CIRCUITS	
IC601	I.C.	3133-5114-805
IC602	I.C.	3133-5114-801
IC603	I.C. (Specify Frequency)	3133-5114-804
IC604	I.C.	3133-5114-802
IC605	I.C.	3133-5114-803

ITEM	DESCRIPTION	PART NO.

10-8 TONE ENCODER BOARD 302-508

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R605	10K, Trimmer	4751-0103-002
R607	100K, 10%, ¼W	4701-0104-042
	CAPACITORS	
C604	.2 mfd, +80-20%, 12v (DISC)	1502-0204-006
C605	.01 mfd, +80-20%, 12v (DISC)	1502-0103-006
C606	25 mfd, 10v, 85°C (Electrolytic)	1513-0250-001
C609	.1 mfd, +80-20%, 12v (DISC)	1502-0104-005
C610	.01 mfd, +80-20%, 12v (DISC)	1502-0103-006
	INTEGRATED CIRCUITS	
IC603	I.C. (Specify Frequency)	3133-5114-804
IC604	I.C.	3133-5114-802

ITEM	DESCRIPTION	PART NO.

10-9 CHASSIS ASSEMBLY

ITEM	DESCRIPTION	PART NO.
	ELECTRICAL COMPONENTS	
R501	1meg,10%,¼W	4701-0105-044
R502	7.5K,Squelch Control	4750-3211-202
R503	5K,Volume Control	4750-3211-201
C501	.005mfd,1.4kv(DISC)	1501-0502-002
C502	500mfd,25v,85°C (Electrolytic)	1511-0501-003
C503	4200mfd,40v (Electrolytic)	1516-0422-001
C504	.05mfd,+80-20%,25v(DISC)	1502-0503-004
FTC501	.001mfd,20% (Feed Thru)	1521-0102-001
FTC502	.001mfd,20% (Feed Thru)	1521-0102-001
FTC503	.001mfd,20% (Feed Thru)	1521-0102-001
FTC504	.001mfd,20% (Feed Thru)	1521-0102-001
FTC505	.001mfd,20% (Feed Thru)	1521-0102-001
FTC506	.001mfd,20% (Feed Thru)	1521-0102-001
FTC507	.001mfd,20% (Feed Thru)	1521-0102-001
FTC508	.001mfd,20% (Feed Thru)	1521-0102-001
FTC509	.001mfd,20% (Feed Thru)	1521-0102-001
FTC510	.001mfd,20% (Feed Thru)	1521-0102-001
FTC511	.001mfd,20% (Feed Thru)	1521-0102-001
FTC512	.001mfd,20% (Feed Thru)	1521-0102-001
FTC513	.001mfd,20% (Feed Thru)	1521-0102-001
FTC514	.001mfd,20% (Feed Thru)	1521-0102-001
FTC515	.001mfd,20% (Feed Thru)	1521-0102-001
CR501	Diode,Silicon,Rectifier	4806-0000-004
CR502	Diode,Silicon,Rectifier	4806-0000-004
CR503	Diode,Silicon,Rectifier	4806-0000-005
CR504	Diode,Silicon,Rectifier	4806-0000-005
SPK501	Speaker Assy	1301-0000-003
SW501	Switch SPST	5114-0000-001
J501	Connector,Microphone	2105-0000-023
J502	Connector,Antenna	2105-0000-020
J503	Connector,Antenna	2105-0000-020
IC501	Module RF Amp UHF	3132-5112-501
Q501	Transistor,SJ5149	4803-0000-005
T501	Transformer	5604-5097-100
F501	Fuseholder	2100-0000-003
F502	Fuseholder	2100-0000-003
F503	Fuseholder	2100-0000-003
	Fuse,2 Amp 3AG	5106-0000-004
	Fuse,5 Amp,3AG	5106-0000-008
	Connector Housing,Male	2109-5120-408
	MECHANICAL COMPONENTS	
	Heat Sink	5400-0000-001
	Heat Sink	5400-1285-601
	Heat Sink	5400-1260-900
	Insulator Bushing	2501-0000-001
	Insulator Mica Washer	3103-0000-001
	Transistor Socket	2108-0000-002
	Shield	2508-3400-500
	Wrap	1408-5401-400
	Power Cord	6041-3181-501
	Terminal Strip	2103-3008-004
	Terminal Strip	2103-5000-120
	Capacitor Clamp	2830-0000-002

ITEM	DESCRIPTION	PART NO.

10-10 MA-116 & MA-121 TONE BOARDS

ITEM	DESCRIPTION	PART NO.
	RESISTORS	
R601*	200K Var	4751-0204-007
R602*	200K MF	4709-3402-401
R603*	301K MF	4709-3402-402
R604*	348K MF	4709-3402-403
R605*	453K MF	4709-3402-404
R606*	348K MF	4709-3402-403
R607*	453K MF	4709-3402-404
R610*	1K,10%,¼W	4701-0102-042
R611*	220K,10%,¼W	4701-0224-042
R612	100K Var	4751-0104-002
R613	27K,10%,¼W	4701-0273-042
R614	27K,10%,¼W	4701-0273-042
R615	680K,10%,¼W	4701-0684-042
R616	18K,10%,¼W	4701-0183-042
R617*	22K,10%,¼W	4701-0223-042
R618*	10K Var	4751-0103-002
R619*	18K,10%,¼W	4701-0183-042
R620	10K,10%,¼W	4701-0103-042
R621	4.7K,10%,¼W	4701-0472-042
R622	18K,10%,¼W	4701-0183-042
R623*	680K,10%,¼W	4701-0684-042
R624*	330K,10%,¼W	4701-0334-042
R625	10K,10%,¼W	4701-0103-042
R626*	330K,10%,¼W	4701-0334-042
R627	22K,10%,¼W	4701-0223-042
R628*	1K,10%,¼W	4701-0102-042
R629*	180ohm,10%,¼W	4701-0181-042
R630*	820ohm,10%,¼W	4701-0821-042
R631*	100ohm,10%,¼W	4701-0101-042
R632	47K,10%,¼W	4701-0473-042
R633	15K,10%,¼W	4701-0153-042
R634	33K,10%,¼W	4701-0333-042
R635	15K,10%,¼W	4701-0153-042
R636	33K,10%,¼W	4701-0333-042
R637	15K,10%,¼W	4701-0153-042
	CAPACITORS	
C601*	2700pf,5%,500V(MICA)	1504-0272-505
C602*	2700pf,5%,500V(MICA)	1504-0272-505
C603	.1 mfd,20%,12V(DISC)	1502-0104-005
C604	.0047 mfd,10%,100V(MYLAR FILM)	1508-0472-610
C605	.047 mfd,10%,100V(MYLAR FILM)	1508-0473-610
C606	.01 mfd,10%,100V(MYLAR FILM)	1508-0103-610
C607	.1 mfd,20%,12V(DISC)	1502-0104-005
C608	.001 mfd,10%,100V(MYLAR FILM)	1508-0102-610
C609*	.1 mfd,20%,12V(DISC)	1502-0104-005
C610*	50 mfd,10V,85D(ELECTROLYTIC)	1513-0500-001
C611	1 mfd,16V,85D(ELECTROLYTIC)	1513-0010-002
C612	1 mfd,16V,85D(ELECTROLYTIC)	1513-0010-002
C613	25 mfd,10V,85D(ELECTROLYTIC)	1513-0250-001
C614	10 mfd,16V,85D(ELECTROLYTIC)	1513-0100-001
C615	15 mfd,16V,85D(ELECTROLYTIC)	1513-0150-002
	DIODES	
CR601	SIL	4805-1241-200
CR602	SIL	4805-1241-200
CR603*	ZENER 8.2V	4808-0000-009
CR604	SIL	4805-1241-200
	INTEGRATED CIRCUITS	
IC601*	I.C.	3130-3167-909
IC602*	I.C.	3130-3167-909
IC603*	I.C.	3130-3167-909
IC604	I.C.	3130-3157-621
	TRANSISTORS	
Q601	NPN	4801-0000-010
Q602	NPN	4801-0000-010
Q603	NPN	4801-0000-010

ITEM	DESCRIPTION	PART NO.

* Indicates components also used on MA-121

LIMITED WARRANTY

1. The warranty applies to the original or subsequent owners of the product for a period of 90 days from the original purchase date.
2. We agree to repair or replace all parts showing defects in material or workmanship.
3. Warranty service will be provided free of charge if unit is delivered to the Regency dealer of original purchase, or to us intact, transportation charges prepaid, within 90 days of the date of sale to the original purchaser.
4. The warranty does not apply to units subject to misuse, neglect, accidents, incorrect wiring not our own, improper installation, or units used in violation of the instructions furnished by us. Nor does the warranty apply to units: damaged by lightning, excess current, repaired or altered by unauthorized personnel, or units with altered or removed serial numbers.
5. To have your unit serviced under the warranty return it, freight prepaid to dealer of original purchase, or:

Customer Service Department - or - Customer Service Department
Regency Electronics, Inc. Regency Communications, Inc.
7707 Records Street 1227 S. Patrick Drive
Indianapolis, Indiana 46226 Satellite Beach, Fla. 32937

Only factory authorized personnel are authorized to perform warranty service.

6. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.
7. Warranty will not be in force unless a completed warranty registration card is received by Regency.